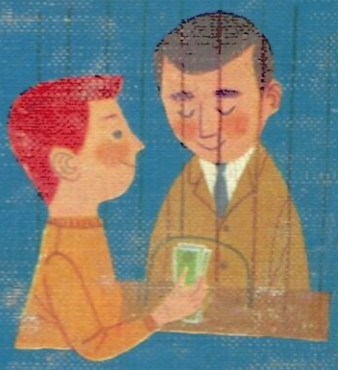
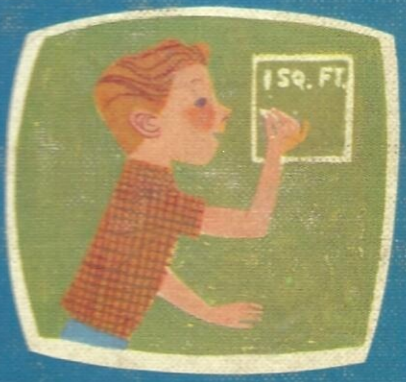
7

EXPLORING

Arithmetic





PART 2

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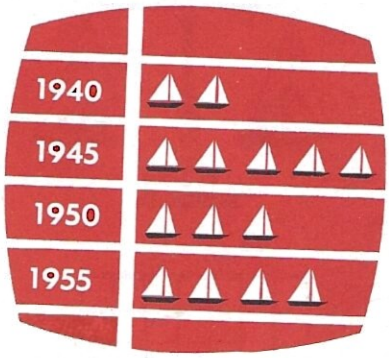
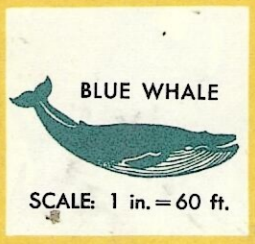
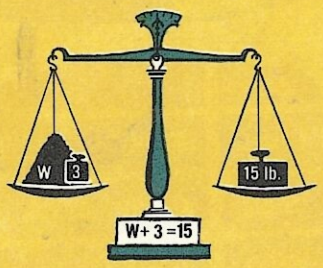
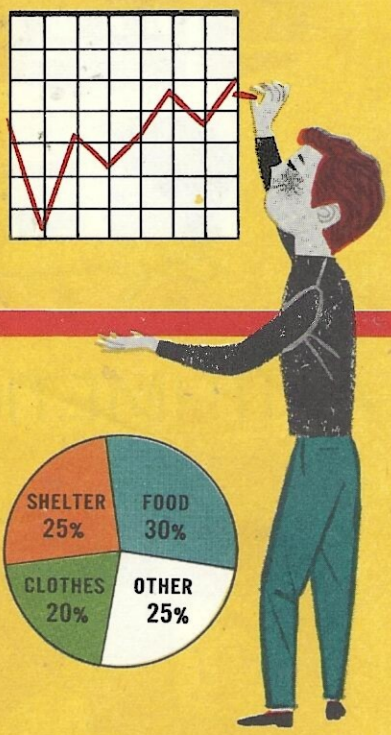
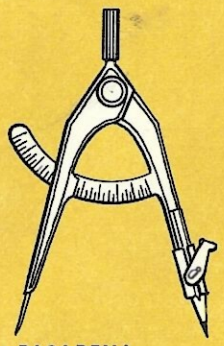


EXPLORING ARITHMETIC









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EXPLORING

Arithmetic

JESSE OSBORN ADELINE RIEFLING HERBERT F. SPITZER

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Illustrated by Winnie Fitch and Obata and Associates

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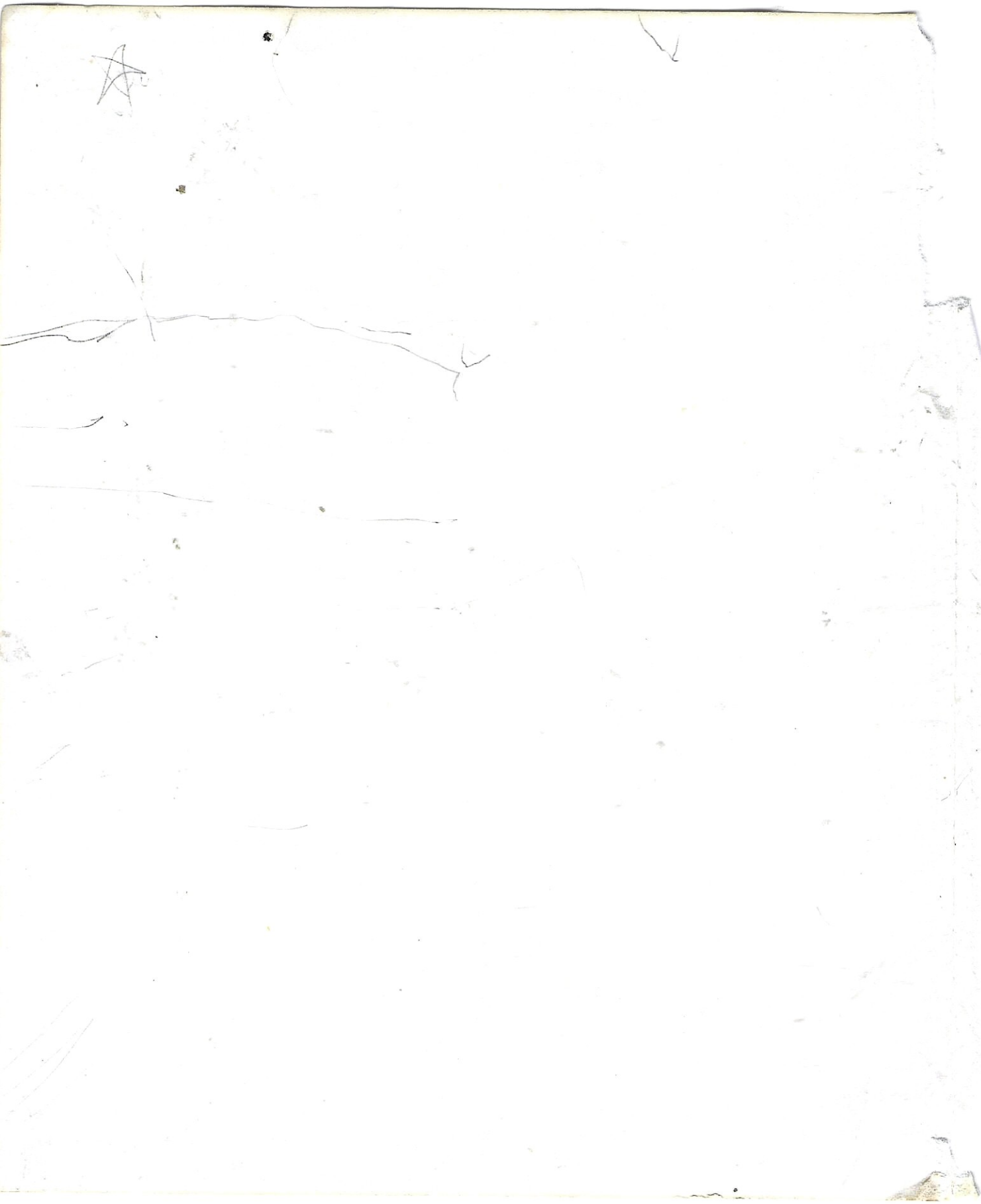


Making Weights Balance

An old-time grocer had only four weights for his balance scales — a 15-pound weight, a 5-pound weight, and two 1-pound weights. With these weights he had to figure the weights of the various items.

1. The picture shows that a ham and the 5-pound weight exactly balance the 15-pound weight and a 1-pound weight. How much does the ham weigh?

To solve the problem, write a statement, called an *equation*, which shows that the two sides of the scale balance, or that they are equal, as

$$\text{Ham} + 5 = 15 + 1$$

How many pounds must be removed from the left side to have only the ham remaining? If 5 lb. are removed from the left side, how many pounds must be removed from the right side to keep the scales balanced? If 5 lb. are subtracted from the right side, how many pounds remain? This will be the weight of the ham.

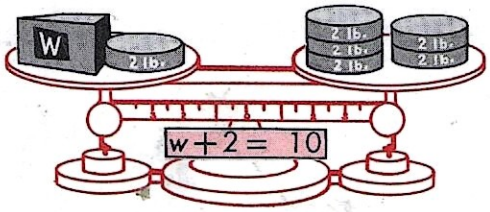
2. Write the equation which shows that a ham and a 1-pound weight balance the 15-pound weight and the 5-pound weight. How much does the ham weigh?

3. A square of bacon weighed 9 lb. Explain why the following equation shows how the grocer arranged his weights to check this.

$$b + 5 + 1 = 15$$

4. Use the grocer's four weights to balance each of the following: 8 lb.; 12 lb.; 19 lb.; 13 lb. Write an equation to show the balance for each.

5. The old-time grocer's weights were enough to weigh any number of pounds from 1 lb. to 22 lb. Explain.



Solving Equations

The scales above are balanced. You may take any weight you choose from one side. The scales will stay balanced if you take the same weight from the other side.

You need to subtract 2 from the left side to have w alone. Then you must subtract 2 from the right side to keep the balance.

$$\begin{array}{rcl} w+2 & = & 10 \\ -2 & = & -2 \\ \hline w & = & 8 \end{array}$$

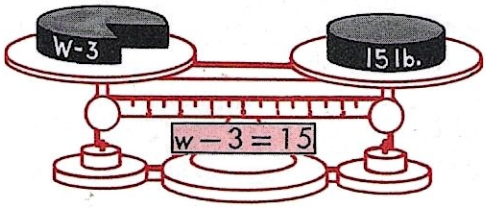
This is called *solving the equation.* This equation was solved by subtracting the same number from each side.

Solve the equations.

1.	$w+3=12$	$w+5=13$
2.	$w+1=10$	$w+4=12$
3.	$w+2=6\frac{1}{4}$	$w+\frac{1}{2}=3\frac{1}{2}$
4.	$w+.2=3.2$	$w+.5=7.2$
5.	$w+.8=4.0$	$w+4=6.5$
6.	$w+1\frac{1}{4}=10$	$w+7=12\frac{1}{2}$

An equation that has a number added to a letter may be solved by subtracting the number from each side of the equation.

If 3 lb. are subtracted from a certain weight *(w)*, the remainder is equal to 15 lb. The picture and the equation below show this.



The scales are balanced. The $w-3$ tells that 3 has been subtracted from one side of the equation. You must add 3 lb. to the left side to have w alone. You must add 3 lb. to the right side to keep the balance.

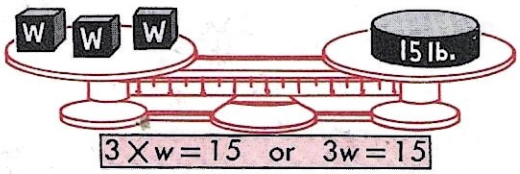
$$\begin{array}{rcl} w-3 & = & 15 \\ +3 & = & +3 \\ \hline w & = & 18 \end{array}$$

This equation was solved by adding the same number to both sides.

Solve the equations.

7.	$w-5=8$	$w-3=7$
8.	$w-2=9$	$w-4=12$
9.	$w-2\frac{1}{2}=6$	$w-3\frac{1}{2}=4\frac{1}{2}$
10.	$w-3=6\frac{1}{4}$	$w-1\frac{1}{4}=3\frac{1}{2}$
11.	$w-.3=.5$	$w-.8=7.7$
12.	$w-.4=5.0$	$w-4=6.6$

An equation that has a number subtracted from a letter may be solved by adding the number to each side of the equation.



$3 \times w = 15$ or $3w = 15$

The scales above are balanced. You must divide the amount on the left side by 3 in order to have one w alone. You must divide the right side by 3 to keep the balance.

$$3w = 15$$
$$3w \div 3 = 15 \div 3$$
$$w = 5$$

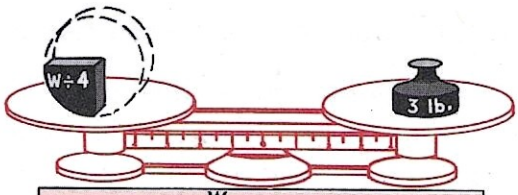
This equation was solved by dividing both sides by the same number.

Solve the equations.

13. $12w = 72$ $\quad 8w = 60$
14. $9w = 72$ $\quad 7w = 56$
15. $24w = 60$ $\quad 32w = 96$
16. $36w = 54$ $\quad 40w = 60$
17. $2\frac{1}{2}w = 10$ $\quad 2\frac{1}{4}w = 4\frac{1}{2}$
18. $.2w = 3$ $\quad 1.5w = 3$

An equation that has a letter multiplied by a number may be solved by dividing each side of the equation by the number.

The scales at the top of the next column are balanced. You must multiply the left side by 4 to have a whole w alone. You must multiply the right side by 4 in order to keep the balance.



$\frac{1}{4}w = 3$ or $\frac{w}{4} = 3$ or $w \div 4 = 3$

This equation was solved by multiplying both sides by the same number.

$$\frac{1}{4}w = 3$$
$$\times 4 = \times 4$$
$$\frac{4}{4}w \text{ or } w = 12$$

Solve the equations.

19. $w \div 7 = 13$ $\quad \frac{w}{6} = 12$
20. $w \div 2 = 14$ $\quad \frac{w}{9} = 7$
21. $w \div 40 = 2\frac{1}{2}$ $\quad \frac{w}{24} = 4$
22. $w \div 32 = 2\frac{1}{2}$ $\quad \frac{w}{36} = 1$
23. $w \div 4 = 1.5$ $\quad \frac{w}{3} = 2\frac{1}{2}$
24. $w \div 4 = 2\frac{1}{2}$ $\quad \frac{w}{.2} = 4$

An equation that has a letter divided by a number may be solved by multiplying each side of the equation by the number.

In earlier grades, when you found missing numbers as in the examples below, you were really solving equations. Write a letter in place of each question mark and solve.

25. $\square + 7 = 16$ $\quad \square + 9 = 17$ $\quad 6 + \square = 11$
26. $\square - 4 = 8$ $\quad \square - 8 = 9$ $\quad 15 - \square = 8$
27. $9 \times \square = 72$ $\quad 6 \times \square = 48$ $\quad 8 \times \square = 56$
28. $\square \div 6 = 7$ $\quad \square \div 9 = 9$ $\quad \square \div 9 = 6$

Patterns for Solving Problems

Ted bought a model airplane kit. When he began to assemble the model, he noticed that the pattern and the directions were missing. He had a difficult time figuring out how to put the plane together. With a pattern to follow, it would have been easy.

▶ You have learned to follow patterns, or formulas, when finding areas, volumes, perimeters, and the like. Tell what each of the following formulas means.

1. $a = lw$ $p = 4s$ $p = 2l + 2w$
2. $c = \pi d$ $a = \frac{bh}{2}$ $r = \frac{d}{2}$
3. $p = a + b + c$ $a = s^2$ $v = lwh$

Use the correct formula to find the following.

4. Area of a square with sides 4 in.

5. Circumference of a circle with radius $3\frac{1}{2}$ in.

6. Area of a rectangle with length 8 in. and width 5 in.

7. Perimeter of a rectangle with length 8 in. and width 5 in.

8. Radius of a circle with diameter $3\frac{1}{2}$ in.

9. Volume of a solid 5 in. wide, 9 in. long, and 3 in. high.

10. Perimeter of a triangle with sides 3 in., 4 in., and 5 in.

11. Perimeter of a square with sides 4 in.

12. Area of a triangle with base 3 in. and height 5 in.

▶ The first step in solving any problem is to find the pattern for solving it. Think what steps you must follow to solve problem 13.

13. A box of crackers weighs 14 oz. What is the weight of 24 such boxes of crackers?

The pattern may be stated in words or as a formula. Study the following word pattern and formula.

■ **To find the total of several similar items (t), multiply the amount in one item (a) by the number of items (n).**

$t = a \times n$

14. A book is $1\frac{1}{4}$ in. thick. Use the pattern or formula to find the height of 12 books of the same thickness.

▶ The following pattern can be used to solve another type of problem.

■ **To find the amount of one item (a), divide the total of all the items (t) by the number of items (n).**

Study the formula below and use it to solve the problems that follow.

$$a = t \div n \quad \text{or} \quad a = \frac{t}{n}$$

15. There are 32 pupils in a room. Each room is given 576 sheets of drawing paper. How many sheets is this per pupil?

16. How many cards at 8¢ each can you buy for $6?

▶ Make a drawing, write a formula, or state a pattern in words to help solve problems like the following. Then supply sensible numbers and solve the problems.

17. Mrs. Dorris bought bread, butter, bacon, and other items at the grocery. Find the total cost.

18. Earl bought a knife. How much change should he get back?

19. Mr. Ellis used a tankful of gasoline in making a trip. How many miles was this per gallon?

20. Bus fare is c¢ per mile. Find the bus fare for m mi.

21. Mr. Burris has an orchard. There are r rows of trees with t trees in each row. How many trees are there in all?

▶ You may need to know a number from a table of measures before you can solve a problem. Tell the number you need and how to use it in solving each of the following problems. Then solve the problems.

22. The volume of a tank is 1155 cu. in. How many gallons will it hold?

23. The volume of a tank is 12 cu. ft. How many gallons will it hold?

24. A rectangular farm is 120 rd. long and 80 rd. wide. How many acres are in the farm?

25. What is the cost of 3750 lb. of coal at $24 a ton?

26. What is the weight in pounds of 32 cu. ft. of water?

27. Find the cost of 100 lb. of wheat at $2.40 a bushel.

28. Bert's steps are 2 ft. long. How many steps does he take in walking 50 yd.?

29. A bicycle moves ahead $7\frac{1}{3}$ ft. each time a wheel makes a complete turn. How many times does the wheel turn when the bicycle goes one mile?

30. A store paid $4.50 for a gross of pencils. The store sold the pencils at 5¢ each. Find the profit.

31. At a track meet some runners raced 440 yd. What part of a mile was this?

32. What is the cost of $2\frac{1}{2}$ gal. of milk at 21¢ per quart?

Mixed Practice

Write as decimals.

1. $\frac{3}{4}$ $\frac{3}{5}$ $\frac{1}{8}$ $\frac{7}{20}$ $\frac{9}{50}$
2. 5% 35% 4% 40% 1%

Write as common fractions in lowest terms.

3. .8 .08 .12 .30 .125
4. 25% 60% 8% 1% $37\frac{1}{2}\%$

Write as per cents.

5. $\frac{1}{2}$ $\frac{3}{4}$ $\frac{1}{3}$ $\frac{2}{5}$ $\frac{3}{8}$
6. .3 .03 $.12\frac{1}{2}$ .01 .15

240	560	336	648	1664

7. Find $\frac{3}{8}$ of each number above.
8. Find .25 of each number above.
9. Find $12\frac{1}{2}\%$ of each number above.

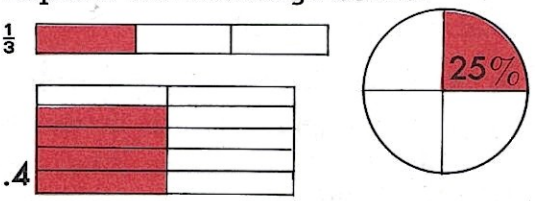
600	120	465	31.5	16.5

10. Find $\frac{2}{3}$ of each number above.
11. Find .6 of each number above.
12. Find 20% of each number above.

Choose the number in parentheses that is the correct answer. Write answers only.

13. $\frac{2}{3} \times 12$ (24; 8; 4)
14. $\frac{5}{6} \times \frac{3}{4}$ ($\frac{15}{8}$; $\frac{5}{24}$; $\frac{5}{8}$)
15. $12 \div \frac{2}{3}$ (8; 18; 24)
16. $\frac{3}{4} \div \frac{5}{6}$ ($\frac{5}{8}$; .9; $1\frac{1}{9}$)
17. $1\frac{2}{3} \times .75$ ($1\frac{1}{4}$; .45; .6)
18. $1.8 \div \frac{2}{3}$ (12; 1.2; 2.7)
19. $.75 \div 1\frac{2}{3}$ ($1\frac{1}{4}$; 2.25; .45)
20. $\frac{2}{3} \times .18$ (1.2; .12; .27)
21. $500 \times .05$ (2.5; 25; 250)

22. Fractions, decimals, and per cents may be used to show parts. Explain the drawings below.



Make drawings to show these parts.

23. $\frac{3}{4}$ .25 50% $\frac{1}{8}$ $33\frac{1}{3}\%$
24. $\frac{2}{5}$ .7 30% $\frac{3}{10}$ .125

The problems below are from an arithmetic book that is more than 100 years old. Work carefully.

25. If 15 gold pens cost \$20, what will 3 gold pens cost?
26. If 7 yd. of cloth cost $\$24\frac{1}{2}$, what will 9 yd. cost?
27. If $\frac{7}{8}$ acre of land is worth \$14, what are 10 acres worth?
28. If 5 lb. of indigo cost $\$32\frac{1}{2}$, what will 2 lb. cost?
29. What will 13 lb. of coffee cost if 26 lb. cost \$7?
30. If 5 lamps cost $\$7\frac{1}{2}$, what will 7 lamps cost?

No Pencils, Please

▶ In the following examples, write *Yes* if the statement is true. If the statement is false, write *No* and the reason why the statement is false.

1. All of these numbers can be divided exactly by 2.
   16 24 38 136 163

2. All of these numbers can be divided exactly by 5.
   25 40 52 75 90

3. All of these numbers can be divided exactly by 10.
   30 70 140 200 305

4. When dividend and divisor are both whole numbers, the quotient must be a whole number.

5. When multiplicand and multiplier are both whole numbers, the product must be a whole number.

6. When divisor and quotient are both whole numbers, the dividend must be a whole number.

7. The product of two mixed numbers can never be a whole number.

8. The quotient of two mixed numbers may be a whole number.

▶ In the next four problems, write the answer from the numbers in parentheses which is correct or approximately correct.

9. A newspaper told of an airplane flying 2524 mi. Jack wrote the number as 2354 mi. The number Jack wrote is about (2; 20; 200) mi. less than the number in the paper.

10. A travel guide said it was 1506 mi. from Kansas City to San Francisco. Susie copied the number as 1560 mi. The number she copied was (6; 54; 60) mi. more than was in the guide.

11. The number 24.3 is (10; 100; 1000) times as much as .0243.

12. The product $.075 \times 16$ is equal to (12; 1.2; .12).

▶ Think carefully before writing answers to the following.

13. What is the next number after 21 that can be divided exactly by 4?

14. What is the next number after 26 that can be divided exactly by 6?

15. Tell without multiplying which product is larger: (a) 28×51, or (b) 51×27.

16. Tell without dividing which quotient is larger: (a) $981 \div 37$, or (b) $979 \div 37$.

Ratio

The illustration at the right appeared in a geography book. The statements compared the amounts of land and water on the earth's surface.

1. The statement within the first arrow compares the earth's land area with the total area. What two areas are compared within the second arrow?

2. What decimal fraction of the earth's surface is land? Water?

3. What per cent of the earth's surface is land? Water?

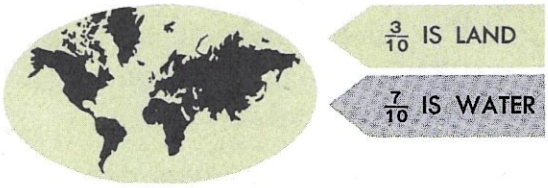
4. If the total area of the earth were cut up into 10 equal parts, how many parts would be land? How many parts would be water?

5. What is the total area of the earth's surface? What is the total land area?

The geography book stated that the *ratio* of land area to total area is 3 to 10. This means that when we compare the total land area (60 million sq. mi.) with the total area (200 million sq. mi.), it will be the same as comparing 3 to 10. Prove that this is true.

The ratio can also be stated as $\frac{3}{10}$ or .3. In other words, the land area is $\frac{3}{10}$ as much as the total area.

THE EARTH'S SURFACE —
Nearly 200,000,000 square miles



The ratio of land area to total area is 3 to 10.

6. What is the water area of the earth's surface? Compare the water area to the total area. Explain why this is a ratio of 7 to 10 or $\frac{7}{10}$.

7. Compare the land area with the water area. There are ? parts of land for every 7 parts of water. Why is the ratio of land to water the same as 3 to 7 or $\frac{3}{7}$? This means that the land area is $\frac{3}{7}$ as much as the water area.

8. Compare the water area with the land area. There are ? parts of water for every 3 parts of land. Explain why the ratio is $\frac{7}{3}$ or $2\frac{1}{3}$. This means that the water area is $\frac{7}{3}$ or $2\frac{1}{3}$ times as much as the land area.

When two numbers are compared by division, the relationship between them is called ratio.

9. John is 63 in. tall. His father is 72 in. tall. Find the ratio of their heights. Write the answer as a fraction in lowest terms.

THINK: $\frac{63}{72} = \frac{63 \div 9}{72 \div 9} = \frac{?}{?}$

Write these ratios as fractions in lowest terms.

10. 8 to 12 9 to 15 32 to 48

11. 36 to 48 60 to 72 54 to 72

12. Which of the following ratios are equal to $\frac{2}{3}$? To $\frac{3}{4}$?

8 to 12 9 to 12 18 to 24
18 to 27 63 to 84 26 to 39

13. Dorothy is 12 yr. old. Her mother is 36. The ratio of their ages is ? to ?, or $\frac{?}{?}$. Dorothy is $\frac{?}{?}$ as old as her mother.

▶ Find each ratio in the following problems as a fraction in lowest terms. Then make a simple statement which compares the measures, as in problem 13.

14. Cora weighs 90 lb. Her mother weighs 120 lb.

15. John weighs 100 lb. His father weighs 160 lb.

16. One bicycle costs \$32. Another costs \$48.

17. Joe had 75¢. He spent 45¢.

18. The circumference of a bicycle wheel is 88 in. The diameter is 28 in. What is the ratio of the circumference to the diameter? Where have you used this ratio before?

19. John had 25¢ in his pocket. His father had \$30. Why is it wrong to say that John has $\frac{25}{30}$ or $\frac{5}{6}$ as much money as his father? What must be done before these numbers can be compared?

20. What is the ratio of 8 in. to 2 ft.?

THINK: 2 ft. = ? in.

Find these ratios as fractions in lowest terms.

21. 8 ounces to 3 pounds.

22. 16 inches to 3 feet.

23. 1 ft. 6 in. to 1 yd.

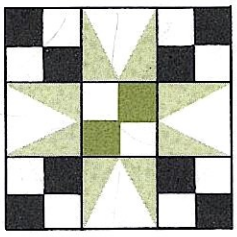
24. 2 qt. to 3 gal.

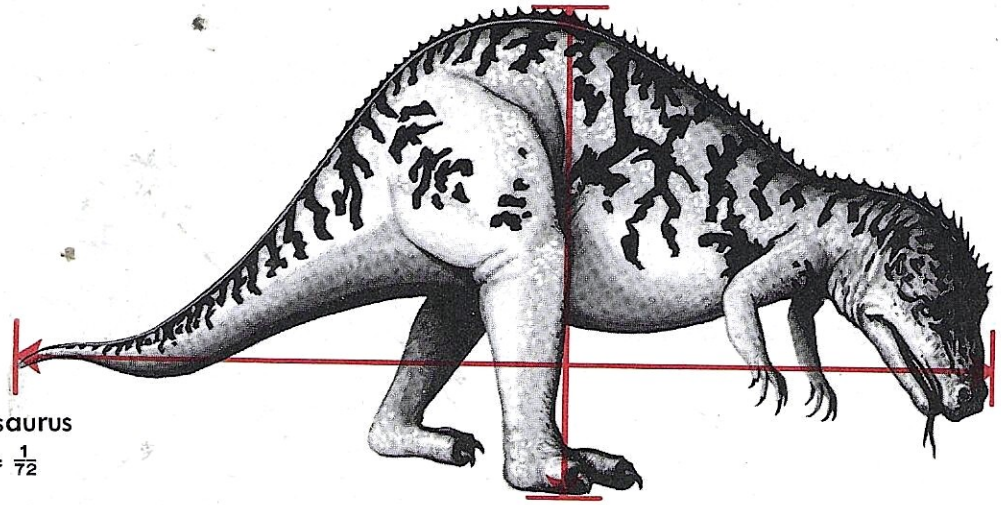
25. 50¢ to \$3.

26. 15 min. to $2\frac{1}{2}$ hr.

■ **Numbers compared in a ratio must be in the same unit of measure.**

27. Find the ratio of the white part to the whole pattern in the following quilt patterns.





Allosaurus
SCALE: $\frac{1}{72}$

Figuring Actual Sizes from Drawings

Ages ago strange monsters roamed over the earth. Scientists have found fossils and made sketches of these monsters. One of these huge animals is called the allosaurus, shown above. The scale tells that the drawing is $\frac{1}{72}$ as large as the actual animal. This means the height or length of the actual animal is 72 times as great as the height or length shown in the drawing.

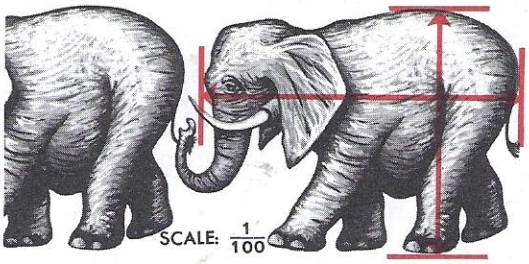
1. Find the actual length of the allosaurus.

THINK: The length of the drawing is about 5 in. The length of the actual animal is about 72 × 5 in. = ☐ in. = ☐ ft.

2. Find the actual height of the allosaurus. Compare the height of the allosaurus with the height of your schoolroom.

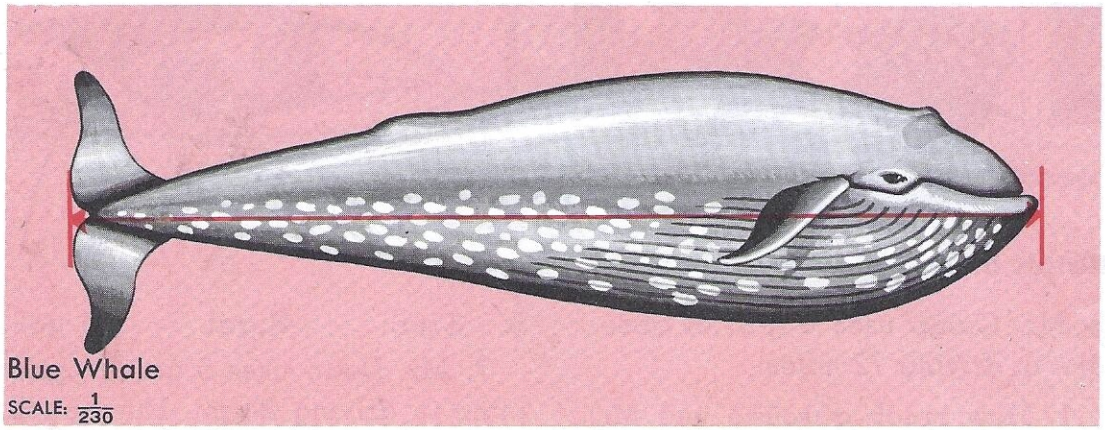
3. What is the height of an elephant shown in the drawing? (Measure to the nearest $\frac{1}{16}$ in.) What is the actual height of an elephant? Compare this with the height of a tall man. With the height of the allosaurus.

Elephants



4. What is the approximate length of an actual elephant?

A playground is 270 ft. square. How many elephants, standing one behind another, would it take to reach along one side of the playground?



Blue Whale

SCALE: $\frac{1}{230}$

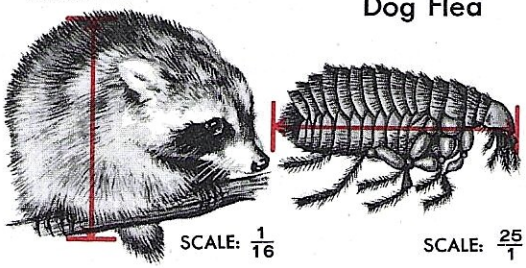
5. What is the length of the whale as shown in the drawing above? What is the actual length of the whale?

The hall in one school extends along three classrooms, a total length of 96 ft. Compare the length of the hall with the length of the whale.

6. What is the height of the raccoon shown in the drawing? What is the actual height of the raccoon?

Raccoon

Dog Flea



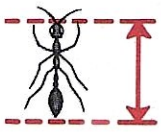
SCALE: $\frac{1}{16}$ SCALE: $\frac{25}{1}$

7. A flea is a very small animal. The drawing above shows it as 25 times as large as it actually is. What is the length of the flea in the drawing? How many actual fleas standing one behind another are needed to make a line 1 inch long?

8. How long is the body, including head, of the house ant in the drawing below? How long is the body, including head, of the actual ant?

If their bodies were placed end to end, how many ants would be needed to make a line 1 ft. long?

House Ant



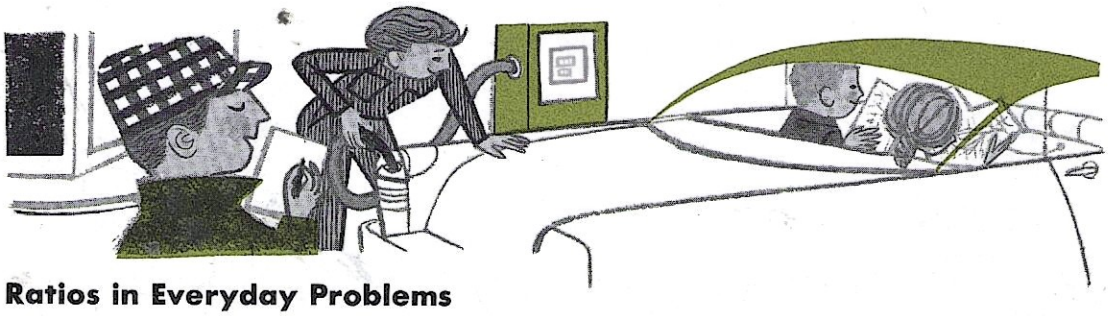
SCALE: $\frac{4}{1}$

Green Turtle

SCALE: $\frac{1}{120}$

9. Some green turtles weigh as much as 800 lb. Compare this with the weight of an average man.

According to the drawing above what is the actual length of a green turtle's shell?



Ratios in Everyday Problems

▶ Mr. Camp uses 6 gal. of gasoline in driving 72 miles.

1. How much gasoline will Mr. Camp need to drive 36 mi.?

Find the ratio of 36 mi. to 72 mi. as a fraction in lowest terms.

$$\frac{36 \text{ mi.}}{72 \text{ mi.}} = \square$$

He will need ☐ as much gasoline to drive 36 mi. as to drive 72 mi.

Find how much gasoline Mr. Camp will need to drive —

2. 18 mi. 54 mi. 90 mi.

3. 108 mi. 144 mi. 126 mi.

4. How many miles can Mr. Camp drive with 4 gal. of gasoline?

Find the ratio of 4 gal. to 6 gal. as a fraction in lowest terms.

$$\frac{4 \text{ gal.}}{6 \text{ gal.}} = \frac{2}{3}$$

He can drive $\frac{2}{3}$ as many miles with 4 gal. as with 6 gal.

$$\tfrac{2}{3} \times 72 \text{ mi.} = \square$$

Find how many miles Mr. Camp can drive with —

5. 2 gal. 8 gal. 12 gal.

6. 3 gal. $4\frac{1}{2}$ gal. 1 gal.

7. Mr. Dean uses 5 gal. of gasoline in driving 84 mi. How much gasoline does he need to drive 21 mi.? 42 mi.?

▶ The bus fare for a trip of 240 mi. is $8.40.

8. At this rate, what is the bus fare for a trip of 300 mi.?

Find the ratio of 300 mi. to 240 mi. as a fraction in lowest terms.

$$\frac{300 \text{ mi.}}{240 \text{ mi.}} = \frac{5}{4} = 1\tfrac{1}{4}$$

The bus fare will be $1\frac{1}{4}$ times as much for 300 mi. as for 240 mi.

$$1\tfrac{1}{4} \times \$8.40 = \square$$

Find the bus fare for —

9. 90 mi. 150 mi. 200 mi.

10. 120 mi. 100 mi. 500 mi.

▶ The flying time for a 720-mile trip is $2\frac{1}{4}$ hr.

11. At this rate, what would be the flying time for a 480-mile trip?

Find the ratio of 480 mi. to 720 mi. as a fraction in lowest terms.

The flying time for 480 mi. is ? the flying time for 720 mi. (Change $2\frac{1}{4}$ hr. to 135 min.)

Find the flying time for these trips.

12. 320 mi. 400 mi. 800 mi.

13. 640 mi. 960 mi. 160 mi.

Light, medium, or thick syrup is used in canning fruit. The table below tells the amounts of sugar and water needed to make certain amounts of syrup.

	SUGAR	WATER	SYRUP
Light	1 c.	3 c.	$3\frac{1}{2}$ c.
Medium	1 c.	2 c.	$2\frac{1}{2}$ c.
Thick	1 c.	1 c.	$1\frac{1}{2}$ c.

14. What is the ratio of sugar to water in the light syrup? In the medium syrup? In the thick syrup?

15. Mrs. Dawes needs 5 c. of medium syrup. How many cups of sugar will she need? How many cups of water?

16. Mrs. Bradford has 4 c. of sugar. How many cups of thick syrup can she make? How much water will she use?

17. Mrs. Sutton needs 15 c. of syrup. How much sugar will she use to make this amount of medium syrup? To make this amount of thick syrup?

Mr. Brown uses a 1-2-4 mixture for concrete. This means that for 1 bucket of cement, he uses 2 buckets of sand and 4 buckets of gravel.

18. What is the ratio of the sand to the gravel?

19. Mr. Brown has $1\frac{1}{2}$ buckets of cement. How much sand will he use with it? How much gravel?

20. Mr. Brown has 6 buckets of sand. How much cement will he use with it? How much gravel?

These ingredients are needed in making 60 cookies.

$\frac{2}{3}$ c. sugar $\frac{3}{4}$ c. butter
$1\frac{1}{2}$ c. flour 2 eggs

Find the amount of each ingredient needed for —

21. 120 cookies 30 cookies

22. 180 cookies 90 cookies

Mr. Hays raises plants for sale. He uses this mixture in making his seed beds: $\frac{3}{10}$ compost; $\frac{3}{10}$ sand; $\frac{2}{5}$ loam.

23. Mr. Hays will need 60 cu. ft. of the mixture. How many cubic feet of compost will this take? How much sand? How much loam?

24. Mr. Hays has 6 cu. ft. of sand. How much compost will he add to it? How much loam?

Problem Solving

▶ Tell what fact is missing in each of the problems below. Choose a number from the parentheses to make a sensible fact. Then solve the problem.

1. How many miles can Ward walk in 5 hr.? (30; 18; 3)

THINK: The missing fact is the number of miles Ward can walk in 1 hr. The most sensible number from the parentheses is 3, because 3 miles per hour is a sensible rate for a boy to walk. A boy cannot walk 30 miles per hour or 18 miles per hour. 5×3 mi. $=$ ☐ mi.

2. Find the cost of 8 dozen oranges. (12¢; 45¢; $4)

3. Irene bought a quart of ice cream. She gave the clerk $5. How much change should she get back? (5¢; 50¢; $4.50)

4. How many slices of bread will 6 large loaves make? (8; 30; 100)

5. A real estate company gets a commission of $2\frac{1}{2}\%$ for selling homes. The company sold a brick home for Mrs. Anderson. How much was the commission? ($1000; $2500; $18,000)

6. What is the weight of $7\frac{1}{2}$ bu. of potatoes? (30; 48; 60)

7. The total weight of the boys was 504 lb. What was their average weight? (2; 6; 18)

8. Miss Hays will give each pupil in the room 2 oranges. How many oranges will she need to buy? (30; 60; 120)

9. Mr. Ellis drove to Greenville in $4\frac{1}{2}$ hr. What was his average rate per hour? (18; 162; 450)

10. What is the cost of 10 gal. of gasoline? (10¢; 30¢; 75¢)

11. A mechanic earns $106 a week. How much is this per hour? (18; 40; 70)

12. Sam bought a suit at 25% less than the regular price. How much did Sam have to pay for the suit? ($5; $50; $500)

13. How many glasses of lemonade can be served from 6 qt. of lemonade? (5; 20; 35)

14. How many automobiles are needed to take 48 children to a picnic? (2; 4; 10)

15. The scout troop needs about 40 frankfurters. How many pounds of frankfurters should they buy? (8; 16; 32)

▶ In each of the following problems, certain familiar facts must

be used in order to solve. If you do not know the necessary fact, look for it in tables of measures.

16. A brick is 8 in. long. Mrs. Thorpe wants to place bricks end to end to make a border 40 ft. long. How many bricks will she need?

THINK: I need to know how many inches equal 1 foot.

17. How many 6-ounce boxes can a grocer fill with 3 lb. of pepper?

18. A brick is 8 in. long and 4 in. wide. How many bricks are needed to cover an area of 2 sq. ft.?

19. A swimming pool is 45 ft. long, 22 ft. wide, and 10 ft. deep. How many gallons of water will it hold?

20. The school served a half pint of milk to each of 800 pupils. How many gallons was this?

21. Chemical fertilizer is $95 a ton. At this rate, what is the cost of 600 lb.?

22. In 1863 Abraham Lincoln used the words, "Four score and seven years ago." Subtract four score and seven years from 1863.

23. There are 5280 ft. in a mile. How many rods are in a mile?

24. A farmer sells plums at 50¢ a half peck. How much will he get for 3 bu. of the plums?

25. A rope is 24 yd. long. How many 8-foot jumping ropes can be made from it?

26. A grocer bought potatoes at $1.80 a bushel. He sold them at 4¢ a pound. How much did he gain per bushel?

27. Milk is 75¢ a gallon, or 24¢ a quart. What per cent higher is the quart rate than the gallon rate?

28. The bank teller put 40 quarters in a roll. How many dollars was this?

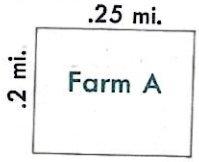
29. A garden is 4 rd. wide. How many feet is this?

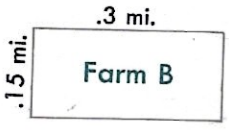
30. A piece of carpet is 6 ft. wide and 12 ft. long. How many square yards is this?

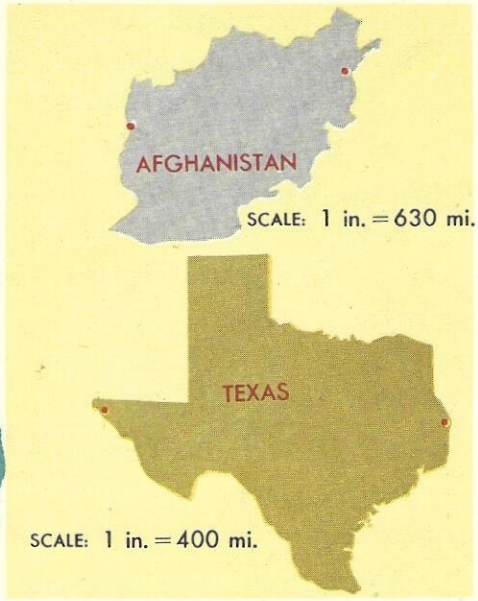
31. A factory worker is allowed 16 min. to do a certain job. How many of these jobs can he do in 8 hr.?

32. How many 9-inch pieces can be cut from 2 yd. of ribbon?

33. At $200 per acre, which farm costs more? How much more?







Using Ratios in Map Reading

Jack read in a geography book that Afghanistan is about the size of Texas. When he went to an atlas to check, it seemed that the book was wrong because on the maps Texas looked much larger than Afghanistan.

1. The maps above are exactly the same size as in the atlas. What had Jack forgotten? Can you tell from looking at the two maps which area is greater?

2. Measure the distance between the red dots on the map of Texas. On the map of Afghanistan. Figure what the actual distances are.

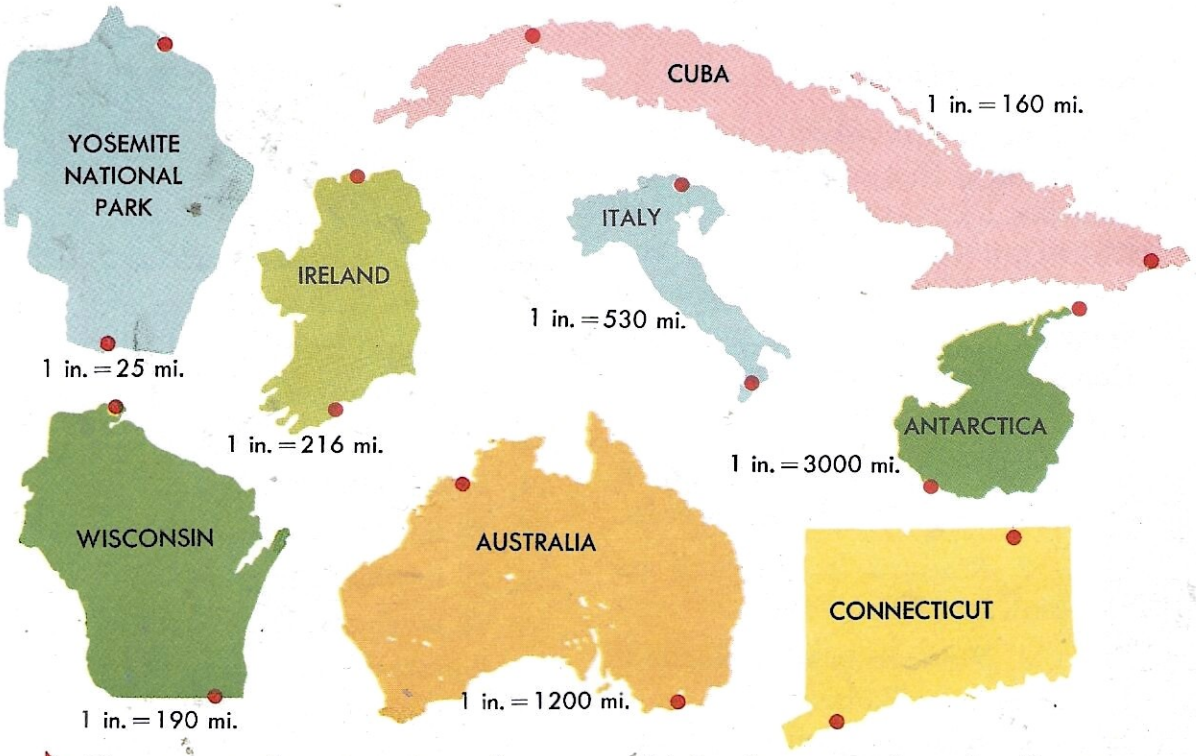
When comparing distances on two different maps, why is it necessary to find actual distances?

3. The scale on the map of Afghanistan is one inch to 630 miles. What is the ratio of the distance on the map to the actual distance?

THINK: To find a ratio, both numbers must be in the same unit of measure. Therefore, I must change 630 miles to inches. (Round to the nearest million.) The ratio is 1 to ? million.

Can you see why maps give scale in so many miles to the inch rather than as a ratio? Explain.

To find the actual distance in miles between two points on a map, multiply the number of miles per inch given in the scale by the map distance in inches.



The maps above appeared on various pages of an atlas. Refer to them in the following problems.

4. In which map does 1 inch represent the greatest distance? The smallest distance?

5. Ireland and Antarctica appear to be about the same size on the maps above. Are they actually about the same size? Explain.

Measure the distance between the red dots on each of these two maps. What is the actual distance represented on each of the maps?

6. Measure the distance between the red dots on the map of Italy. Figure the actual distance. On which other map does the distance between the red dots represent this same actual distance?

7. Compare the maps of Australia, Wisconsin, and Yosemite National Park. Can you tell which of these three is actually the largest without measuring? Explain. Find the actual distance between the red dots on each map.

8. No scale is given for the map of Connecticut. If the distance between the two red dots represents an actual distance of 80 miles, what is the scale of the map?

THINK: $1\frac{1}{4}$ in. = 80 mi.

1 in. = $80 \div 1\frac{1}{4} =$ ☐ mi.

Comparing Numbers

When Jill was asked to compare the height of Niagara Falls (160 ft.) with the height of Ribbon Falls in California (about 1600 feet), she discovered that there were several ways to compare the two numbers. Complete and explain the following.

1. Ribbon Falls is $\frac{1600}{160}$ or ? times as high as Niagara Falls.

2. Niagara is $\frac{160}{1600}$ or ? as high as Ribbon Falls.

3. Niagara is what decimal as high as Ribbon Falls?

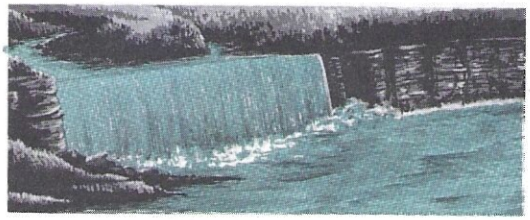
4. The height of Niagara Falls is ? % of the height of Ribbon Falls.

5. Ribbon Falls is ? % as high as Niagara.

6. The ratio of the height of Niagara to the height of Ribbon Falls is 160 to 1600 or 1 to ?. This is equal to $\frac{1}{?}$ or ? %.

7. The ratio of the height of Ribbon Falls to the height of Niagara Falls is ? to 160 or ? to 1. This is equal to $\frac{?}{1}$ or ?.

All the above statements compare the heights of the two falls by division. We find the comparison number, or ratio, by dividing.



Find the following.

8. 8 is what fraction of 12?
9. 50 is what fraction of 125?
10. 300 is what fraction of 720?
11. 320 is what fraction of 240?
12. 16 is what decimal part of 25?
13. 36 is what decimal part of 75?
14. 48 is what decimal part of 30?
15. 3 is what per cent of 8?
16. 28 is what per cent of 35?
17. 72 is what per cent of 50?

18. Ned earns $\frac{2}{3}$ as much as his father. His father earns $420 a month. How much does Ned earn per month?

19. Alice earns $200 a month. This is $\frac{5}{8}$ as much as Jane earns. How much does Jane earn per month?

20. Tom earns $180 a month. Dick earns $240 a month. What is the ratio (fraction) of Tom's earnings to Dick's earnings?

21. The regular price of a rug is $150. The sale price is $120. What per cent is the sale price of the regular price?

Work with Decimals

Copy and add. Check.

1. 7.8; 15.0; 1.3; .9; 18.5
2. 1.32; .95; 13.20; 1.75; .86
3. 72.3; 1.5; .9; 16.0; 6.1
4. \$1.25; \$6.50; \$9; \$.70; 19¢
5. \$67; 90¢; \$15.40; \$7; \$1.20
6. .324; 1.469; 16.120; 54.304
7. .005; .069; 1.005; .534; .064
8. \$654.97; \$12.60; \$765; \$125

Copy and subtract. Check.

9. 8.0 − .4 .76 − .05
10. 17.2 − 6.9 .459 − .409
11. \$60 − \$.48 \$7.65 − \$4
12. \$.90 − 5¢ \$6.25 − 40¢

13. A machine part weighs .3 ounce. What is the weight of 10 parts? Of 100 parts? Of 1000 parts?

14. A screw weighs .15 ounce. What is the weight of 10 screws? Of 100 screws? Of 1000 screws?

Find the cost of the following.

15. 10 5-cent stamps.
16. 100 3-cent stamps.
17. 1000 2-cent stamps.

18. A sheet of thin book paper is .002 in. thick. What is the thickness of 10 sheets? Of 100 sheets? Of 1000 sheets?

19. Give a short-cut rule for multiplying a number by 10; by 100; by 1000.

20. Multiply each number in the box below by 10.

.06	7	.004	9	20	18.5

21. Multiply each number in the box above by 100.

22. Multiply each number in the box above by 1000.

23. Ten machine parts weigh 6.2 oz. What is the weight of one of the parts?

24. A hundred screws weigh 12.5 oz. What is the weight of one of the screws?

25. Four ounces of a chemical were put into 1000 gallons of water. How much was this per gallon? How much per quart?

26. Divide each number in the box below by 10.

3.2	.5	8	7.00	120	25

27. Divide each number in the box above by 100.

28. Divide each number in the box above by 1000.

29. Give a short-cut rule for dividing a number by 10; by 100; by 1000.

Multiplying and Dividing with Decimals

▶ Estimate a sensible answer. Choose the number from parentheses that is nearest the sensible answer that you estimate.

1. 6×3.02 (1.8; 18; 180; 1800)
2. 7×42.2 (3; 30; 300; 3000)
3. 12×2.9 (3.6; 36; 360; 3600)
4. $38 \times .42$ (1.6; 16; 160; 1600)

▶ Multiply. Write the decimal point in the product so that your answer is sensible.

5.	3.84 × 9	71.2 × 8	.638 × 80	8.46 × 60
6.	9.32 × 46	58.4 × 72	.774 × 27	42.9 × 81

▶ Estimate a sensible answer. Choose the number in parentheses that is nearest your estimate.

7. $.03 \times 7.9$ (.024; .24; 2.4)
8. $.81 \times .04$ (.032; .32; 3.2)
9. $.31 \times 8.8$ (.026; .26; 2.6)
10. 7.2×2.9 (.21; 2.1; 21; 210)

▶ Multiply. Write the decimal point in the product so that your answer is sensible.

11.	5.64 × .8	78.2 × .03	166 × .09	.593 × 7
12.	.604 × 3.2	1.54 × 1.8	609 × 4.5	8.15 × 48

▶ Estimate a sensible quotient. Choose the number in parentheses that is nearest your estimate.

13. $\$9 \div 3$ (3¢; 30¢; \$3; \$30)
14. $\$36 \div 40$ (9¢; 90¢; \$9; \$90)
15. $8.4 \div 4$ (.2; 2; 20; 200)
16. $12.6 \div 6$ (.02; .2; 2; 20)

▶ Divide. Write the decimal point to make the quotient sensible. Check by multiplying.

17. $8\overline{)10.24}$ $72\overline{)20.16}$
18. $9\overline{)382.5}$ $84\overline{)352.8}$
19. $7\overline{)22.82}$ $92\overline{)5.336}$

20. Divide 10.24 by 3.2. Explain each step in the work below. Finish the division.

$$\frac{10.24}{3.2} = \frac{10 \times 10.24}{10 \times 3.2} = \frac{102.4}{32} =$$

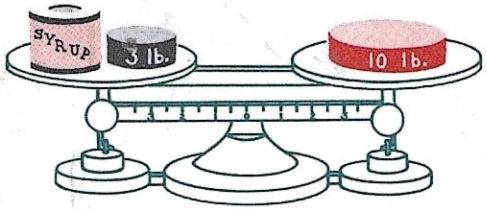
$$3.2\overline{)10.24} = 32\overline{)102.4}$$

▶ Change each divisor and dividend below so that each divisor is a whole number. Find the quotients.

21. $4.2\overline{)705.6}$ $.72\overline{)4.032}$
22. $.064\overline{)40.96}$ $43.7\overline{)12236}$
23. $.37\overline{)814}$ $4.9\overline{)14.749}$
24. $9.3\overline{)5.859}$ $.079\overline{)47.4}$
25. $.099\overline{)98.01}$ $1.2\overline{)9.324}$

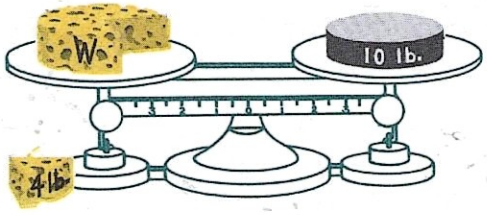
How Well Have You Learned?

1. What is the weight of the can of syrup in the picture below?



2. A grocer has a 1-pound, a 3-pound, and a 9-pound weight. Draw balances to show how he can weigh a 5-pound bag of sugar. A 7-pound bag of sugar.

3. The whole cheese on the scale below weighed w lb. A 4-pound slice was cut from it. Write an equation that tells what the balances show.



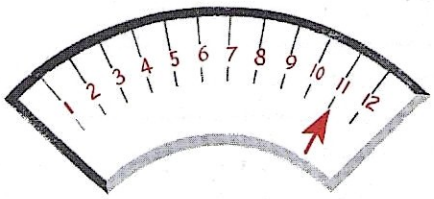
4. Let the weight of a whole cheese be w pounds. Write an equation which tells that a 2-pound slice has been cut off, and that what remains weighs 16 lb.

Solve these equations.

5. $w+4=9$ $\quad w+3=10$

6. $w-4=10$ $\quad w-2=16$

7. $4w=20$ $\quad \frac{w}{4}=20$



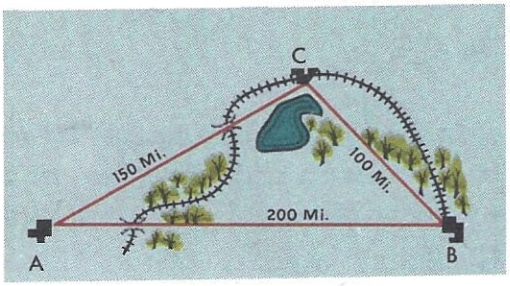
8. Write the formula for finding the perimeter of a triangle. Use it to find the perimeter of a triangle with sides 4 in., 5 in., and 8 in.

9. Write the formula for finding the area of a rectangle. Use it to find the area of a rectangle 8 in. long and 6 in. wide.

10. The state of Maryland is about 200 mi. long and 120 mi. wide. Find, as fractions in lowest terms, the ratio of its width to its length; its length to its width.

11. A man uses $\frac{3}{4}$ gal. of gasoline in driving 12 mi. At this rate how many gallons would he use in driving 72 miles?

12. The drawing below shows the location and distances between three cities. The scale used was 1″ = ? miles. What is the ratio of the distance AB to the distance BC?



Help Yourself to Improve

1. Write an equation to show how to use a 3-pound weight and a 15-pound weight to weigh a 12-pound ham. (173)

2. A grocer cut $3\frac{1}{2}$ lb. from a roll of cheese that had weighed w lb. The part left weighed $11\frac{1}{2}$ lb. Write an equation to show this. (174)

Solve these equations. (174)

3. $w+8=13$ $\quad w-8=7$

4. $w+7\frac{1}{2}=10$ $\quad w-2\frac{1}{4}=8$

5. $w+3.2=6.8$ $\quad w-.8=4.8$

6. Let the weight of each apple be w oz. Write an equation which tells that the weight of 6 apples is 48 oz. (175)

7. A large box of candy weighed w lb. It was divided into four equal parts. Write an equation to show that one of the parts weighed $1\frac{1}{2}$ lb. (175)

Solve these equations. (175)

8. $2\times w=12$ $\quad 2\frac{1}{2}w=15$

9. $\frac{w}{3}=12$ $\quad \frac{w}{5}=2.8$

Find ratios in examples 10 to 13. Find each ratio as a fraction in lowest terms. (180)

10. Ronny weighs 60 lb. Elsie weighs 80 lb. The ratio of Ronny's weight to Elsie's weight is ?.

11. A ball cost 80¢ and a bat $1.00. The ratio of the cost of the ball to the cost of the bat is ?.

12. Find the ratio of 6 oz. to 1 lb.; 36 min. to 2 hr.

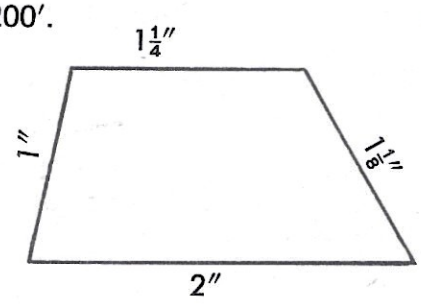
13. Find the ratio of 1 yd. to 1 ft.; 1 ft. to 8 in.

14. The scale of a drawing of a deer is $\frac{1}{40}$. In this drawing the deer is $1\frac{1}{2}$ in. tall. What is the actual height of the deer? (182)

15. A medium syrup is made with 1 c. of sugar and 2 c. of water. This makes $2\frac{1}{2}$ c. of the syrup. How much sugar is needed to make 15 c. of the syrup? (185)

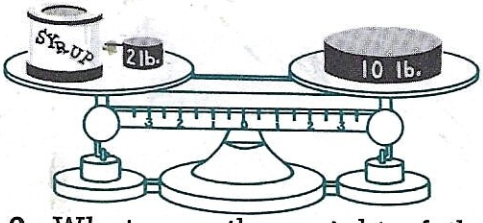
16. Mr. Brown uses a 1-2-4 mixture for concrete. He has 3 buckets of sand. How much cement will he use? How much gravel? (185)

17. Find the length of each side of the field shown in the drawing below. The scale used was 1″ = 200′. (182)

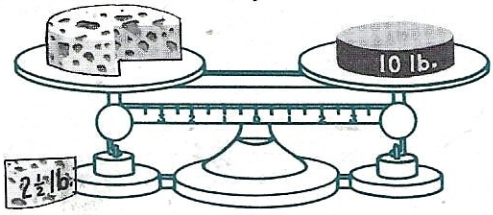


Show That You Know

1. What is the weight of the can of syrup?



2. What was the weight of the cheese before any was cut off?



3. Draw a balance to show how to use a 1-pound weight, a 3-pound weight, and a 10-pound weight to weigh a 12-pound ham. Write the equation.

4. Write an equation to show how to use a 4-pound weight and a 15-pound weight to weigh an 11-pound ham.

Solve these equations.

5. $w+5=13$ $\quad w+2\frac{1}{4}=6\frac{1}{4}$
6. $w-6=13$ $\quad w-2\frac{1}{2}=7\frac{1}{2}$
7. $5\times w=10$ $\quad 2\frac{1}{4}w=9$
8. $w\div 3=9$ $\quad \frac{w}{4}=12$

9. Write the formula and use it to find the perimeter of a rectangle 10 in. long and $7\frac{1}{2}$ in. wide.

Write these ratios as fractions in lowest terms.

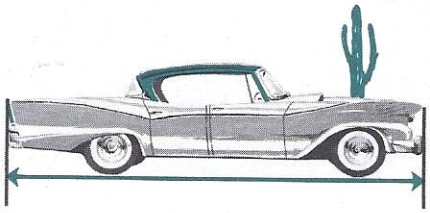
10. \$1.75 to \$5.25
11. 75 cents to \$2.25
12. 8 in. to 1 ft. 4 in.
13. 12 oz. to 2 lb. 4 oz.
14. 6 qt. to 4 gal.
15. 48 min. to 2 hr.
16. 36 days to 3 mo.

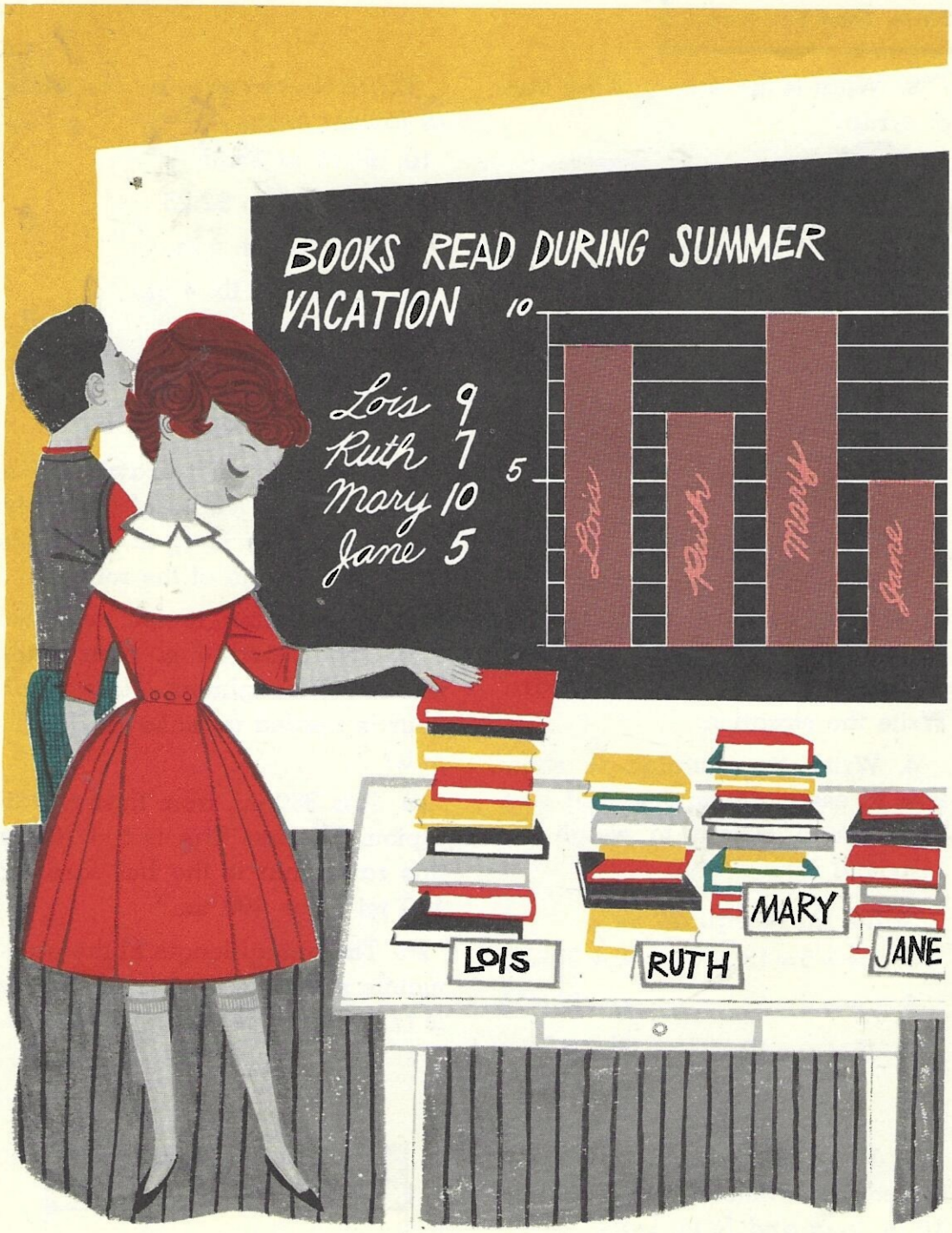
17. The scale of a drawing of a robin is $\frac{1}{5}$. The length of the robin in the drawing is $1\frac{1}{2}$ in. What is the actual length of the robin?

18. A doughnut recipe calls for 1 c. sugar and 4 c. flour. This makes 40 doughnuts. How much flour is needed to make 50 doughnuts?

19. It is 360 mi. from Rushville to Tipton. The bus fare is \$11.70. At this rate what is the bus fare for 180 mi.? For 400 mi.?

20. The actual length of the automobile shown in the picture below is 17 ft. The scale used was 1″ = [illegible] ft.




BOOKS READ DURING SUMMER VACATION
Lois 9
Ruth 7
Mary 10
Jane 5
10
5
Lois
Ruth
Mary
Jane
LOIS
RUTH
MARY
JANE

Reading Graphs

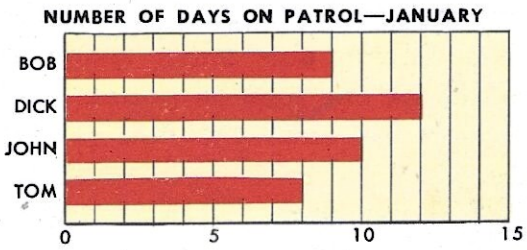
1. Study the picture on the opposite page. Why do the list, the piles of books, and the drawing all tell the same thing? Which way tells the facts most quickly?

2. How does the drawing on the board, called a *graph*, show the number of books read by each girl? How does it show the various girls? Can you see why this kind of graph is called a *bar graph*?

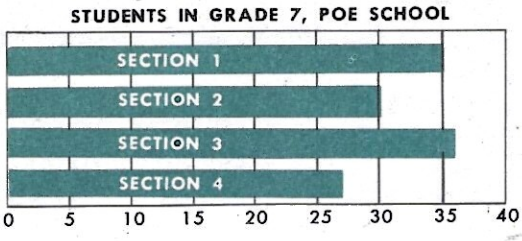
3. How many books did each girl read? Who read the most? The least? Who read twice as many as Jane? Of the three ways of showing how many books each girl read, which gives the most help in comparing numbers? Why?

■ **A graph is a drawing which presents facts in picture form so that they will be easy to understand and to compare.**

4. Read the bar graph at the top of the next column. How many days did each boy serve on the safety patrol during January?



5. Read the bar graph below. How many students are there in each section? Why is there a line for every five students instead of every one? How can you tell how many there are in sections 3 and 4? Would it be more accurate to get the number from a table listing the actual numbers? Why? What is the advantage of the graph?



Making and Reading Bar Graphs

1. During February, Bob, Dick, John, and Tom served the following numbers of days on patrol: Bob, 14; Dick, 12; John, 8; and Tom, 10. Make a bar graph that presents these facts. Follow these steps when you make the graph:

a. Decide how wide to make each bar, and how far apart to make the bars. All bars should be the same width. The distances between bars should be the same.

b. Decide how much space to allow for one time on patrol.

c. Make each bar the proper length.

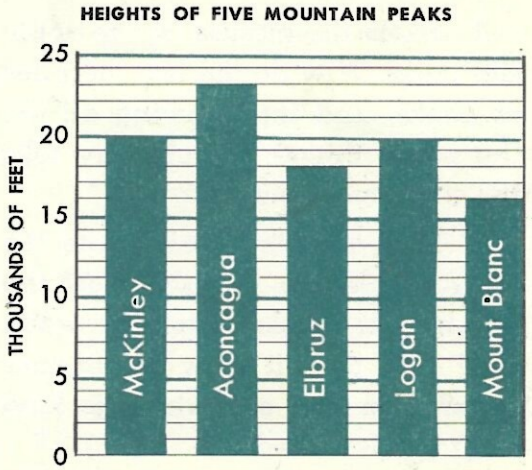
d. Label each part of the graph.

2. This table tells the number of examples Marie got right each day last week. Make a bar graph that shows what the table tells.

Mon.	12
Tues.	9
Wed.	11
Thurs.	14
Fri.	7

3. The table below gives the height in feet of five mountain peaks. How were the figures in the second column rounded?

4. Which figures from the table in problem 3 were used in the bar graph below? Why is it better to use these numbers? For how many feet does each space in the graph stand? Read the graph.



5. Round the length of each river in the table below to the nearest 100 miles. Draw a horizontal bar graph to show the lengths of these rivers. Be sure to

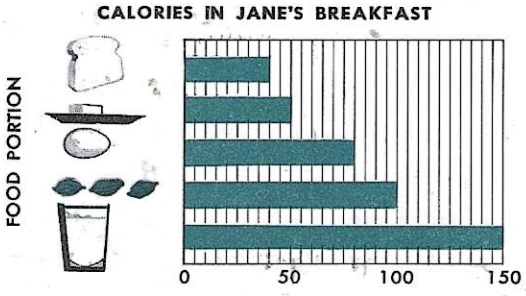
MOUNTAIN	HEIGHT IN FEET	
	ACTUAL	ROUNDED
McKinley	20,300	20,000
Aconcagua	23,081	23,000
Elbruz	18,481	18,000
Logan	19,850	20,000
Mount Blanc	15,781	16,000

RIVER	LENGTH
Mississippi-Missouri	3872 mi.
Amazon	3900 mi.
Congo	2718 mi.
Yukon	1979 mi.
Rio Grande	1885 mi.
Columbia	1214 mi.

label each part of the graph. Why is it a good idea to use a horizontal bar graph for these facts?

6. For breakfast Jane had 1 slice of bread, 1 pat of butter, 1 egg, 3 prunes, and 1 glass of milk.

The number of calories in each item of food is shown in the graph below. How many calories were in each serving? How many calories were there in her breakfast in all? For how many calories does each space in the graph stand? Why isn't there a line for each calorie?



7. The table below tells the number of calories in Jack's dinner. Make a bar graph to show these facts.

FOOD PORTION	CALORIES
2 slices wheat bread	130
2 hamburgers	200
$\frac{1}{2}$ cup baked beans	150
1 large apple	100
1 cup cocoa	150

8. The next table tells the population of the United States for certain years. How were the figures for 1850 and 1870 rounded? Copy and complete the table.

YEAR	POPULATION	
	ACTUAL	ROUNDED
1850	23,191,876	23,000,000
1870	38,558,371	39,000,000
1890	62,947,714	?
1910	91,972,266	?
1930	122,775,046	?
1950	150,697,361	?

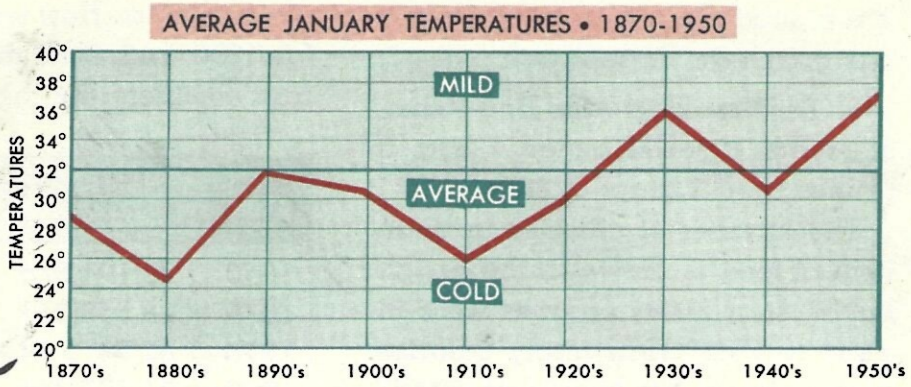
9. Use the rounded population figures in problem 8 to make a bar graph of the population of the United States for the years given. Be sure to label all parts of the graph. For how many people does each space in your graph stand?

10. Jack looked at the graph he had made for problem 9 and said that the population in 1950 was about $6\frac{1}{2}$ times as large as in 1850. Use numbers in the table to prove that Jack is correct.

11. Betty said the population almost doubled between 1890 and 1930. Use numbers in the table to prove that Betty was correct.

12. Find the present population of the United States. Round the figure to the nearest million.

Line Graphs



Grandpa says, "When I was a boy, the winters were really cold. We don't have old-time winters, anymore."

Let's check on Grandpa. The graph above tells the average January temperature for 10-year periods in his city.

Dots on the graph mark the average temperatures. Lines join the dots to make it easy to read from one to the next. The temperatures are measured up and down from freezing (32°).

1. The average January temperature for the 1940's was 31°. Find this on the graph. Read the average temperature for each 10-year period.

2. In what period was the average temperature the lowest? The highest?

3. How many periods from the 1870's to the 1910's were cold? How many were mild?

4. How many periods from the 1920's to 1950's were cold? How many were mild?

5. Do you believe Grandpa is right in what he remembers? Why?

6. This table gives the average February temperatures for the same periods shown in the graph above. Make a line graph to show the facts given in the table.

1870	30°	1900	33°	1930	31°
1880	32°	1910	28°	1940	33°
1890	35°	1920	31°	1950	36°

7. This table shows the average temperatures by months for a recent year. Show these facts with a line graph.

Jan.	38°	May	62°	Sept.	69°
Feb.	38°	June	72°	Oct.	60°
Mar.	43°	July	76°	Nov.	49°
Apr.	51°	Aug.	75°	Dec.	41°

Reading Line Graphs

Tom found the graph at the right in a news magazine and brought it to class. The accompanying article explained that *"1955=100"* meant that prices for all other years were compared to the price of goods which cost 100 cents in 1955. Thus, goods which cost \$1 (100¢) in 1955 cost 30¢ in 1915, 80¢ in 1920, and so on.

1. Tom said that goods which cost 30¢ in 1915 cost 65¢ in 1945. Explain why he was right.

2. Mary said that goods cost only half as much in 1940 as they did in 1955. Explain.

3. A pair of cotton gloves cost \$1 in 1955. What would these gloves have cost in 1915? In 1920?

4. A suit cost \$60 in 1955. What would a like suit have cost in 1935? In 1945?

THINK: 1955 cost = 60 × \$1 = \$60
1935 cost = 60 × 45¢ = ?
1945 cost = 60 × 65¢ = ?

5. A dress cost \$15 in 1955. What would a like dress have cost in 1940? In 1950?

6. A pound of steak cost \$1 in 1955. What was the cost of a pound of equally good steak in 1915? In 1920?

7. Two pounds of pork chops cost \$1.50 in 1955. What was the cost of 2 lb. of equally good pork chops in 1925? In 1945?

8. A dozen eggs cost 60¢ in 1955. What was the cost of a dozen like eggs in 1935? In 1950?

9. Groceries for a family of four cost \$40 a week in 1955. What was the cost of like groceries in 1915? In 1935?

10. A family spent \$450 for clothes in 1955. What would like clothes have cost in 1915? In 1940?

11. A family spent \$25 a week for food in 1940. How much per week would like food cost in 1955?

THINK: 1955 cost (100¢) is $\frac{100}{50}$ or 2 times as much as the 1940 cost (50¢).

1955 cost = 2 times \$25 = ?

Making Line Graphs

1. The table below tells the average income of all persons in the United States for certain years. The averages include all persons, even those without incomes.

1930	$600	1945	$950
1935	$400	1950	$850
1940	$600	1955	$900

Make a line graph to show the facts given in the table.

2. Use the table or your graph in problem 1. What is the ratio of the 1955 income to the 1940 income?

3. Use the graph on page 201. What is the ratio of 1955 cost of consumer goods to the 1940 cost of consumer goods? Did $900 buy as much in 1955 as in 1940? Explain.

4. This table tells the average weekly wages for factory workers.

1930	$25	1945	$45
1935	$20	1950	$55
1940	$25	1955	$70

Make a line graph to show the facts given in the table.

5. Use your graph or the table above. What is the ratio of 1955 factory wages to factory wages in 1940?

In which year, 1940 or 1955, did the factory worker's wages buy more in consumer goods? (See the graph on page 201.)

Mixed Practice

Copy in correct form for working. Do what the signs tell you.

1. $\frac{1}{4}+\frac{1}{2}+\frac{3}{8}$ $\quad\quad$ $\frac{2}{3}+\frac{5}{6}+\frac{1}{12}$
2. $\frac{7}{8}+\frac{1}{2}+\frac{5}{16}$ $\quad\quad$ $\frac{1}{6}+\frac{1}{2}+\frac{2}{3}$
3. $\frac{3}{4}+\frac{5}{6}+\frac{7}{8}$ $\quad\quad$ $\frac{7}{15}+\frac{5}{6}+\frac{2}{3}$
4. $\frac{1}{5}+\frac{1}{2}+\frac{3}{4}$ $\quad\quad$ $\frac{11}{12}+\frac{1}{3}+\frac{3}{8}$
5. $\frac{5}{6}-\frac{1}{2}$ $\quad$ $\frac{3}{4}-\frac{1}{3}$ $\quad$ $\frac{2}{3}-\frac{1}{4}$
6. $\frac{5}{9}-\frac{1}{4}$ $\quad$ $\frac{7}{8}\times 12$ $\quad$ $15\times\frac{5}{6}$
7. $\frac{3}{8}\times\frac{4}{15}$ $\quad$ $\frac{2}{3}\times\frac{15}{16}$ $\quad$ $12\div\frac{2}{3}$
8. $\frac{5}{8}\div\frac{1}{2}$ $\quad$ $\frac{5}{6}\div 2$ $\quad$ $\frac{2}{3}\div\frac{8}{15}$
9. $.438+1.350+.665+17.384$
10. $6.35+.85+89.50+126.47$
11. $99.0+.8+7.3+136.4$
12. $86.54+147.50+45.11+.86$
13. $.775-.038$ $\quad$ $8.42-1.95$
14. $34.0-7.8$ $\quad$ $6.42-.89$
15. $.6\times 7.5$ $\quad$ $8.9\times .43$
16. $.675\times 80$ $\quad$ 3.75×34.2
17. $8.64\div 32$ $\quad$ $16.72\div 44$
18. $156.4\div .68$ $\quad$ $51.34\div 1.7$

No Pencils, Please

This picture reminds you that you are not to use your pencil when you work this page except to write answers.

In examples 1-8, *find the product of the divisor and the quotient. Write the product if it is less than or equal to the dividend. Write x if the product is greater than the dividend.*

1.	$11\overline{)79}$ R 7	$33\overline{)170}$ R 5	$57\overline{)345}$ R 6	$83\overline{)666}$ R 8	$95\overline{)384}$ R 4	$62\overline{)188}$ R 3
2.	$63\overline{)250}$ R 4	$44\overline{)354}$ R 8	$41\overline{)203}$ R 5	$19\overline{)135}$ R 7	$76\overline{)676}$ R 9	$26\overline{)160}$ R 6
3.	$47\overline{)191}$ R 4	$18\overline{)110}$ R 6	$35\overline{)242}$ R 7	$88\overline{)444}$ R 5	$90\overline{)625}$ R 7	$29\overline{)275}$ R 9
4.	$68\overline{)608}$ R 9	$58\overline{)410}$ R 7	$17\overline{)87}$ R 5	$62\overline{)186}$ R 3	$81\overline{)485}$ R 6	$72\overline{)366}$ R 5
5.	$75\overline{)580}$ R 6	$66\overline{)462}$ R 7	$60\overline{)545}$ R 9	$38\overline{)75}$ R 2	$23\overline{)73}$ R 3	$27\overline{)187}$ R 7
6.	$48\overline{)248}$ R 5	$69\overline{)142}$ R 2	$84\overline{)756}$ R 9	$42\overline{)248}$ R 6	$79\overline{)312}$ R 4	$94\overline{)284}$ R 3
7.	$59\overline{)480}$ R 8	$37\overline{)333}$ R 9	$97\overline{)585}$ R 6	$24\overline{)100}$ R 4	$65\overline{)390}$ R 6	$73\overline{)440}$ R 6
8.	$39\overline{)117}$ R 3	$21\overline{)190}$ R 9	$64\overline{)312}$ R 5	$80\overline{)412}$ R 5	$13\overline{)115}$ R 9	$54\overline{)170}$ R 3

9. If Mr. Troy earns \$2.10 per hour, how much does he earn in an 8-hr. day?

10. Jerry earns \$9 a week delivering papers. His father earns \$100 a week. What per cent is Jerry's pay of his father's pay?

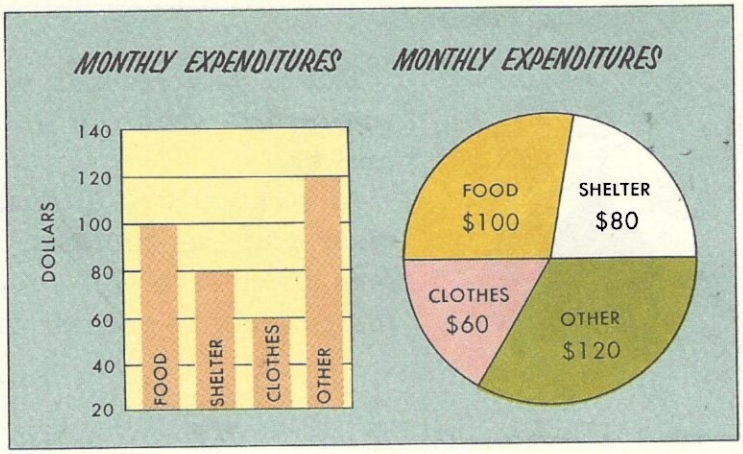
11. Tom spent 50¢. If this was 10 per cent of his money, how much did he have in all?

12. Mr. Dow receives a commission of 12 per cent as a salesman. Mr. Mead gets to keep $\frac{1}{8}$ of the money he receives for the goods he sells. If both men sell \$1000 worth of goods, who earns more?

Circle Graphs

1. The table below gives facts about money spent by the Jones family.

MONTHLY EXPENDITURES	
Food	$100
Shelter	80
Clothes	60
Other	120
Total	$360



Two students made the graphs in the picture above to show these facts. Do both graphs show how much was spent for each item? Which graph makes it easier to compare each expenditure with the total amount spent? Why?

2. Explain the circle graph in the picture. Remember that there are 360° in a whole turn about a point. If 360° stand for $360, for how many dollars will 1° stand? Measure the angles at the center of the circle. How many degrees are there in each part? For how many dollars does each part stand?

3. The graph in the picture was easy to make because the number of dollars spent ($360) was exactly equal to the number of degrees (360°). If the amount spent had been $180, 2° at the center would stand for $1. Explain.

4. If $720 had been spent, 1° at the center would stand for $2. Explain.

5. If $90 had been spent, [illegible]° at the center would stand for $1.

6. If $1080 had been spent, 1° at the center would stand for $[illegible].

Draw circle graphs to show these expenditures. In each case you will need to find the total amount spent.

	FOOD	SHELTER	CLOTHES	OTHER
7.	$60	$45	$35	$40
8.	$150	$250	$200	$120
9.	$30	$25	$20	$15
10.	$240	$300	$270	$270

11. The table at the top of the next page shows how the Browns use their income.

If the total income of the Brown family is $360 per month, how

BROWN FAMILY BUDGET			
Food	30%	Clothes	20%
Shelter	25%	Other	25%

much do they spend for each item?

12. Make a circle graph to show the facts in the Brown family's budget. How many degrees will there be in each part of the graph?

THINK: 30% of 360° = ?°
25% of 360° = ?°
20% of 360° = ?°
25% of 360° = ?°

The tables below tell the per cent of income spent for various items by each of six families.

	SMITH	JONES	WHITE
Food	$33\frac{1}{3}\%$	50%	40%
Shelter	25%	30%	$37\frac{1}{2}\%$
Clothes	20%	10%	20%
Other	$21\frac{2}{3}\%$	10%	$2\frac{1}{2}\%$

	TULLY	ADAIR	KING
Food	$37\frac{1}{2}\%$	30%	50%
Shelter	25%	40%	$33\frac{1}{3}\%$
Clothes	$6\frac{1}{4}\%$	$16\frac{2}{3}\%$	15%
Other	$31\frac{1}{4}\%$	$13\frac{1}{3}\%$	$1\frac{2}{3}\%$

13. Make six circle graphs to show the facts for each family in the tables above. Why will circle graphs show these facts better than bar graphs?

14. Could a circle graph be used to compare the per cent of income spent for food by each family? Why? Why would a bar graph be better.

15. Make vertical bar graphs to show a comparison of the per cent of income spent by each family for food; for shelter; for clothes.

16. The Smiths' income is $360 a month. How much do they allow for each of the four budget items?

17. The Jones family income is $200 a month. How much of this is used for food?

18. The income of the White family is $280 a month. How much do they allow for shelter?

19. The Adairs' income is $600 a month. How much of this do they use for clothes?

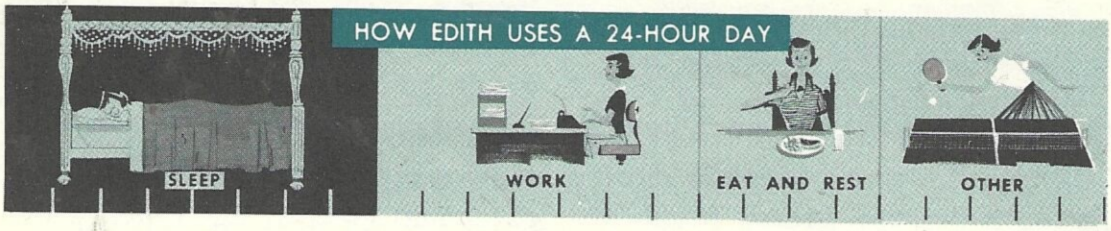
20. The Tully family spend $150 a month for food. What, then, is their monthly income?

THINK: $37\frac{1}{2}\% = \$150$
$1\% = ?$
$100\% = ?$

21. The King family spend $45 a month for clothes. What is their monthly income? Check.

22. A newspaper said that people in Britain had 18,000,000 pets. If 36% of these are cats, how many pet cats are there?

Rectangular Graphs



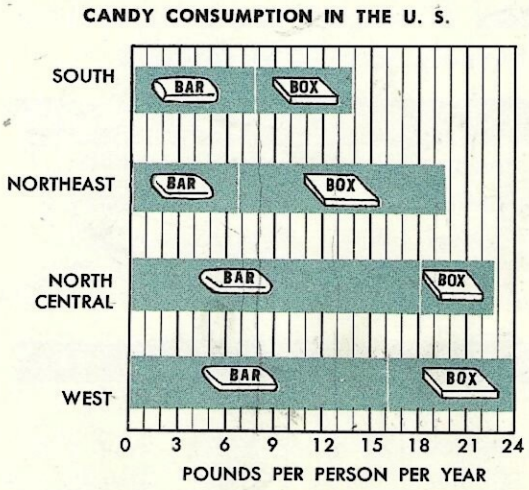
1. Count the number of spaces at the bottom of the graph above. For what does each of these spaces stand? How many hours out of 24 does Edith sleep? How many does she work? How many does she eat or rest? How many are left for other things?

2. Fred's hours are irregular. This table tells how he used his hours last week. Show the facts for each day in a rectangular graph. Place the graphs directly under each other. How does this help you compare each day with the other days?

	SLEEP	WORK	E. & R.	OTHER
MON.	8 hr.	8 hr.	5 hr.	3 hr.
TUE.	7 hr.	10 hr.	5 hr.	2 hr.
WED.	10 hr.	8 hr.	4 hr.	2 hr.
THU.	4 hr.	12 hr.	4 hr.	4 hr.
FRI.	12 hr.	6 hr.	5 hr.	1 hr.
SAT.	6 hr.	4 hr.	4 hr.	10 hr.

3. Do the figures for each day in the table above compare the parts to the whole day? Could you use a circle graph to show these facts? Why?

4. Study the graph below. Why is each bar in the graph really a separate rectangular graph? The four bars help you compare the four sections of the country. What do the divisions within each bar or rectangle help you compare?



5. How many pounds of bar candy does the average person use annually in each of the four sections? How many pounds of box candy?

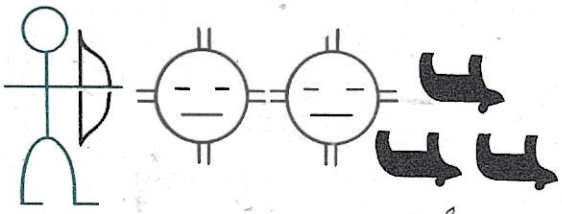
6. What is the total amount of candy used by the average person in each of the four sections?

Picture Graphs

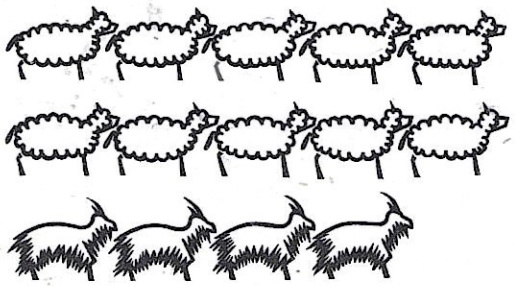
Indians and other primitive people told stories with pictures which really made a sort of graph.

Study each of the graphs below. Then copy and complete the statements.

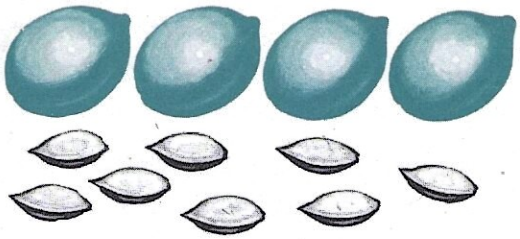
1. The Indian hunter killed ? bears in ? days?



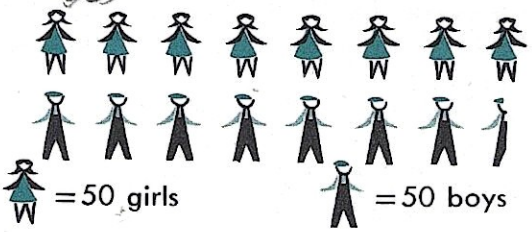
2. The shepherd had ? sheep and ? goats.



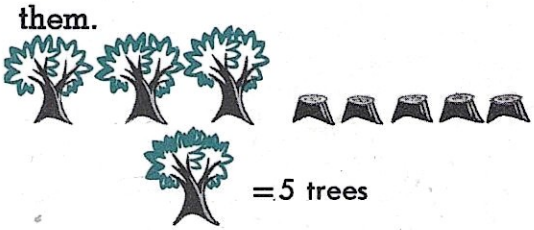
3. Bob ate ? plums. How many did he have left?



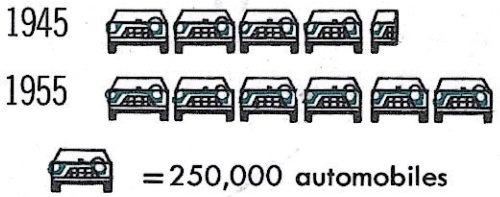
4. There are ? girls in our school, and ? boys.



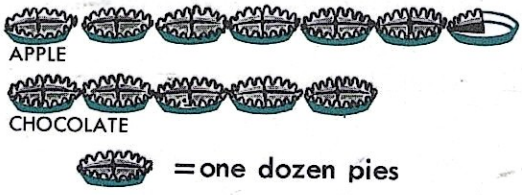
5. There had been ? trees along the road. The woodcutter cut ? of them.



6. There were about ? automobiles in a certain state in 1945. There were about ? automobiles in that state in 1955.



7. The school had ? apple pies and ? chocolate pies at the picnic.



Graphs in Our Reading

1. Arthur read about United States ships and shipping. This picture graph shows how much of our shipping was used in foreign trade.

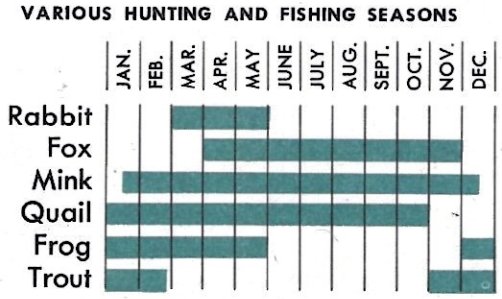
About how many tons of shipping were our foreign trade ships carrying in each of the years shown?

2. The table below tells what types of television programs a group of 90 boys and 72 girls liked best. Make circle graphs to show these facts.

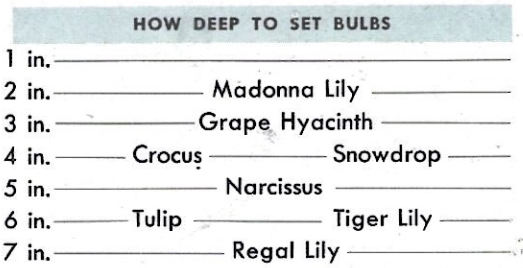
THINK: What per cent of the boys liked each type? What per cent of the girls?

TYPE	BOYS	GIRLS
Novelty	18	13
Comedy	40	25
Romance	17	32
Mystery	15	2

3. Henry went on his vacation in June. According to the graph below, what hunting and fishing could he do according to the game and fish laws?



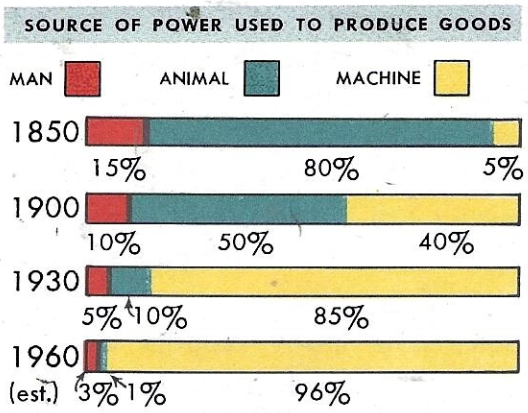
4. Ralph went hunting in November. He killed several rabbits, four quails, and a fox. According to the graph above, did he violate the game law?



5. According to the graph above, how far below the surface of the ground should you put the bottom of each type of bulb?

6. Manpower and animal power, in years past, did the work of

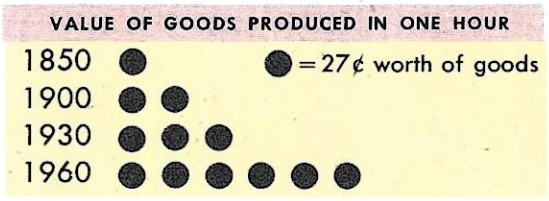
farm and factory. Man dug coal with pick and shovel, and mules hauled. Times have changed.



According to the graph, how much of the power did man supply in 1850? How much was estimated for 1960?

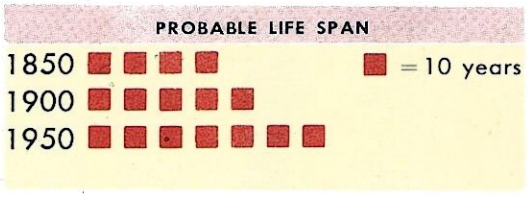
In 1850, animals supplied ? times as much power as machines.

In 1930, machines supplied ? times as much power as animals.



7. Study the graph above. What was the value of goods produced in one hour in 1850? In 1900? What value was estimated for 1960?

8. Probable life span has increased. The graph below tells how many years a person born in certain years could expect to live.



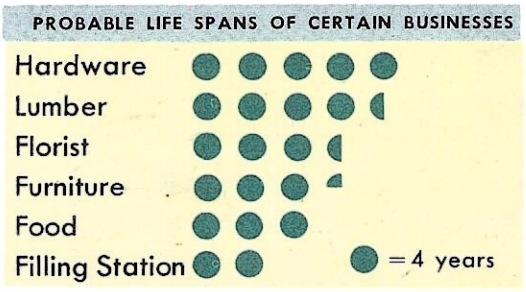
What was the probable life span for a person born in 1850? In 1900? In 1950?

9. A man's probable life span is about 3 yr. shorter than the average life span. A woman's life span is about 3 yr. longer than the average.

Using the graph in problem 8, find the probable life span of a man born in 1850. In 1950.

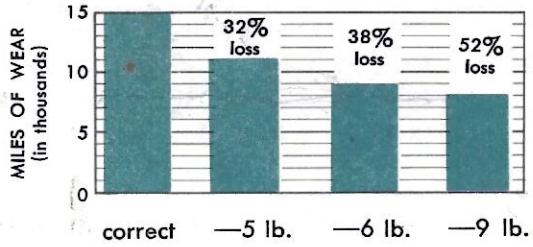
What is the probable life span of a woman born in 1900? In 1950?

10. What is the average life span of a business? Studies show that this depends upon the kind of business it is. Read the graph below.



Problem Solving

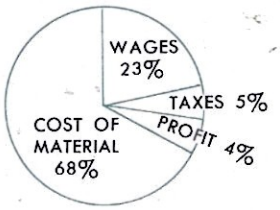
LOSS IN TIRE MILEAGE DUE TO UNDERINFLATION



1. According to the above graph, a certain brand of tire will normally last 15,000 miles, if it is kept properly inflated. How many miles will the tire normally last if it is kept underinflated by 5 lb.? By 6 lb.? By 9 lb.?

2. Mr. Hardy has a factory. He receives a great deal of money each year for the goods made in his factory. The graph tells what becomes of this money.

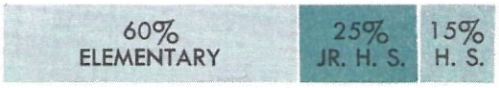
DISTRIBUTION OF INCOME



According to the graph, what per cent of the money does Mr. Hardy keep for himself?

3. Mr. Hardy's sales last year amounted to $2,225,000. How much of this was spent for material? For wages? For taxes? How much was his profit?

PUPILS IN BELLEVUE SCHOOLS



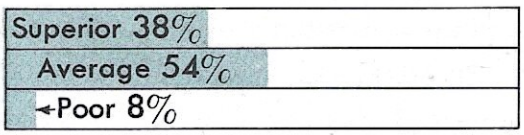
4. There are 2240 pupils in the Bellevue Schools. According to the graph above, how many of these are in the elementary schools? How many are in the junior high? How many are in senior high?

5. According to the graph below, how many months was the average temperature in Centerville less than 40°? More than 70°?

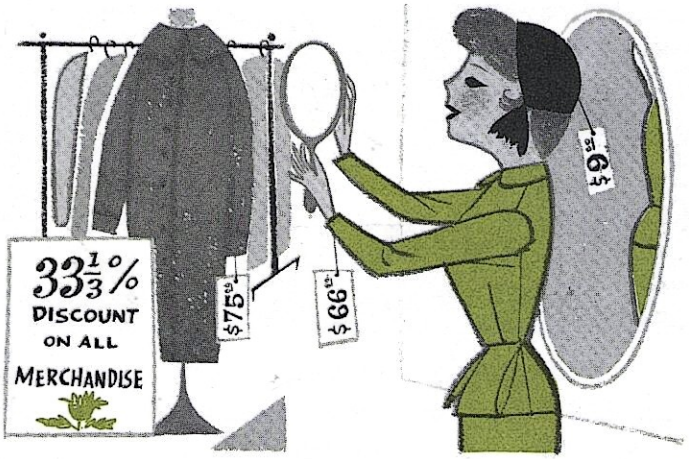
AVERAGE MONTHLY TEMPERATURES

6. The state whose roads are described in the graph below has 10,200 miles of state roads. How many miles of these roads are superior? Average? Poor?

CONDITION OF STATE ROADS



No Pencils, Please



1. What is the sale price of the coat in the picture?

2. How much is the discount on the suit?

3. How much will Mrs. Cole save over the regular prices if she buys a suit, a coat, and a hat?

4. Betty spent $75 for clothes. This was $\frac{3}{4}$ as much as Jane spent. How much did Jane spend?

5. A merchant paid $6 each for dresses. He wants to mark them so that $\frac{1}{3}$ of the selling price will be margin. What should be the selling price?

THINK: Cost plus margin equals selling price. Cost ($\frac{2}{3}$ of selling price) equals $6; margin ($\frac{1}{3}$ of selling price) equals [2]. Selling price equals [2].

6. Suits cost a merchant $24. He wants to mark them so that $\frac{2}{5}$ of the selling price will be margin. What should be the selling price?

7. Ann got $5 interest on her savings account. If this was 2% or $\frac{1}{50}$ of the amount in her account, how much is in her account?

8. Tom had 15 rabbits and sold 9 of them. What part did he sell?

9. Mr. Hall sold 144 eggs. Of these, 24 were graded extra large. What part was graded as extra large?

10. The Blue Jays played 18 games and lost $\frac{1}{6}$ of them. How many games did they win?

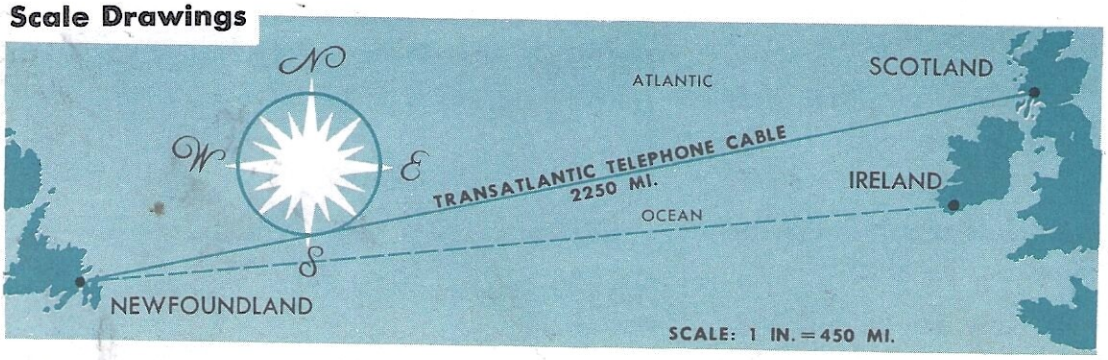
11. Mrs. Spring paid 95¢ for $\frac{5}{8}$ yard of cloth. What was the price per yard?

12. Candy sold at 2 bars for 15¢. What was the price of 4 dozen bars?

13. If 3 tons of coal cost $37.50, what will 1 ton cost? Six tons?

14. Bob sold his bicycle for $\frac{3}{4}$ of what he had paid for it. He sold it for $30. What had he paid for it?

15. Barry saved $8. Lou saved $\frac{4}{5}$ as much. How much did Lou save?



1. It is nearly 100 years since the first telegraph cable was laid across the Atlantic Ocean. Late in 1956, communication engineers finished laying the first telephone cable across the Atlantic. The map above shows the route of the new cable.

Measure the line on the map that marks the length of the new cable. This length stands for an actual distance of 2250 miles. This means that one inch on the line stands for an actual distance of ▯ miles.

We say that 1 inch stands for 450 miles. This may be written in this way:

SCALE: 1 IN. = 450 MI.

2. On your paper write, "Scale: 1 in. = 4 mi." Then, using this scale, draw and label lines that will represent actual distances of 2 mi.; 6 mi.; 12 mi.

3. Write, "Scale: 1 in. = 16 mi." Draw lines that will represent actual distances of 4 mi.; 36 mi.; 108 mi.

4. Let 1 in. stand for 8 ft. What actual distance is represented by a line $\frac{3}{8}$ in. long? $\frac{3}{4}$ in. long?

5. A map has this scale: 1 in. = 400 mi. What will be the length of a line on the map that stands for an actual distance of 300 miles? 600 miles? 900 miles?

6. Use the scale, 1 in. = 40 rd. Make a scale drawing of a field that is 80 rd. long and 40 rd. wide.

7. The scale drawing of a field is 2 in. by $1\frac{1}{2}$ in. (Scale: 1 in. = 20 rd.) What is the actual length and the actual width of the field?

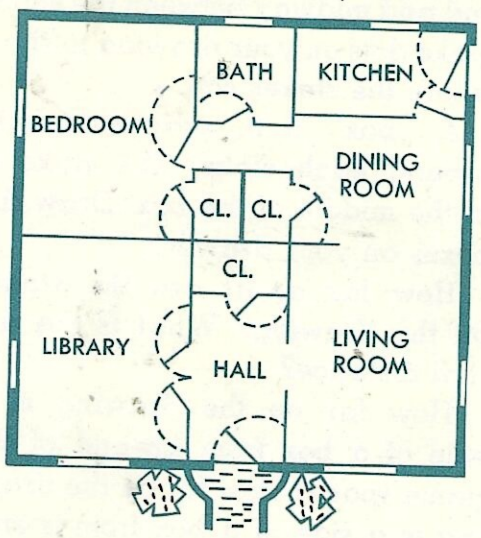
8. The actual length of a field is 20 rd. This length is shown on a scale drawing by a line $2\frac{1}{2}$ in. long. Then, scale: 1 in. = ▯ rd.

9. What is the distance on the map above from Newfoundland to Ireland? For how many actual miles does this distance stand?

10. The actual dimensions of the cottage shown in the plan below are 36 ft. by 36 ft. Measure the length and width in the drawing. What is the scale of the drawing?

$2\frac{1}{4}$ in. = 36 ft.

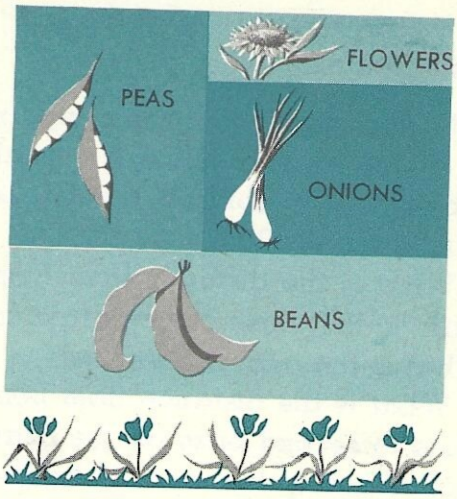
1 in. = 36 ÷ $2\frac{1}{4}$ = ☐ ft.



11. On the drawing the living room is $\frac{7}{8}$ in. wide and $1\frac{1}{8}$ in. long. What are the actual dimensions of the living room?

12. The actual dimensions of the bathroom are 8 ft. by 8 ft. What should the dimensions on the scale drawing be? Check to see whether they are correct.

13. Measure the dimensions on the scale drawing. Find the actual dimensions of the library, the kitchen, the hall, the bedroom, the dining room, and the hall closet.



14. The drawing above is a scale drawing of Glen's garden. The real garden is 16 ft. by 18 ft. Measure the length and width of the garden. Scale: 1 in. = ☐ ft. in the drawing.

15. Find the dimensions on the scale drawing, and then find the actual dimensions of the plots used for peas, onions, beans, and flowers.

16. Ray has a garden 18 ft. by 42 ft. Use the scale, 1 in. = 12 ft. Make a scale drawing of Ray's garden.

17. Lillian has a garden $4\frac{1}{2}$ ft. x 15 ft. Use the scale, 1 in. = 6 ft. Make a scale drawing of Lillian's garden.

18. A pool in the park is a circle with a radius of 12 ft. Use the scale, 1 in. = 8 ft. Make a scale drawing of the pool.

Game Plans

1. A softball infield is a square 60 ft. on a side. Make a scale drawing of a softball infield. Let 1 in. stand for 20 ft.

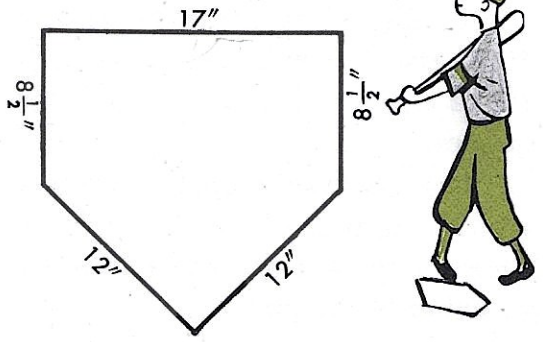
What is the distance from home plate to first base on the drawing? What is the actual distance?

What is the distance from home plate to second base on the drawing? What is the actual distance from home plate to second base?

The actual distance from the pitcher's plate to home plate is 43 ft. Show pitcher's plate on the drawing.

2. In softball, the pitcher's plate is a rectangle 24 in. by 6 in. Make a scale drawing of the pitcher's plate. Use scale: 1 in. = 8 in.

3. Home plate is shaped as in the drawing below. The base is 17 in., each vertical line is $8\frac{1}{2}$ in., and each oblique line is 12 in. Make a scale drawing of home plate. Use scale: 1 in. = 8 in.



4. The game space for horseshoes is a rectangle 10 ft. by 50 ft. Make a scale drawing of this. Use scale: 1 in. = 5 ft.

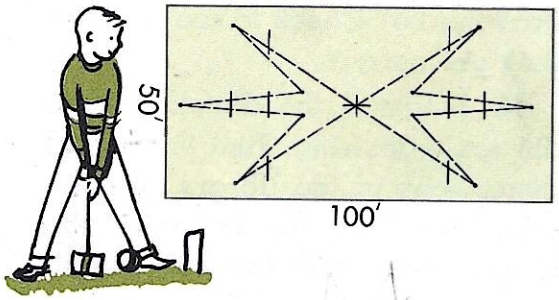
The stakes are 5 ft. from either end and midway between the sides. Make dots on your drawing to show where the stakes are.

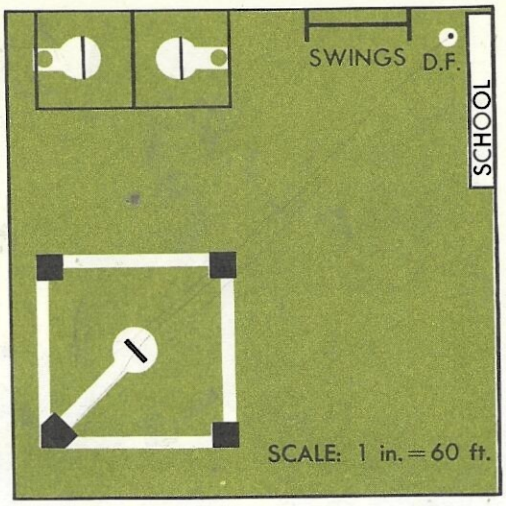
A "box" 6 ft. square is built around each stake. The stake is in the middle of the box. Draw the boxes on your drawing.

How far apart are the stakes on the drawing? What is the actual distance?

How far on the drawing is a side of a box from an end of the game space? How far on the drawing is a side of a box from a side of the game space?

5. The actual length of a croquet court is 100 ft. What is the actual width? Measure the actual length of each line shown in the scale drawing below. What scale is used in the drawing?





6. The seventh grade at the Lincoln School made a scale drawing of their school playground. Study the scale drawing which they made. What are the dimensions of the playground? How far is home plate of the softball diamond from the drinking fountain?

7. Are the bases on the Lincoln School softball diamond the correct length? (See problem 1.)

8. How long and how wide is the Lincoln School outdoor basketball court?

9. If possible, elect committees to measure and make a scale drawing of your playground.

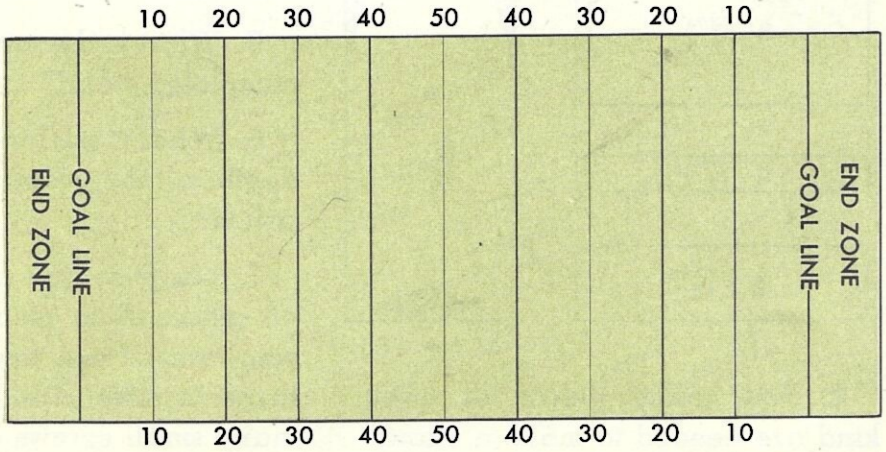
10. Look at the scale drawing of the football field at the bottom of this page. What is the total length of the field? What is the width?

11. In football games you often hear of the "20-yard line" or the "50-yard line." What do the numbers on the side of the field mean?

12. How far is it from goal line to goal line? Prove your answer in two ways.

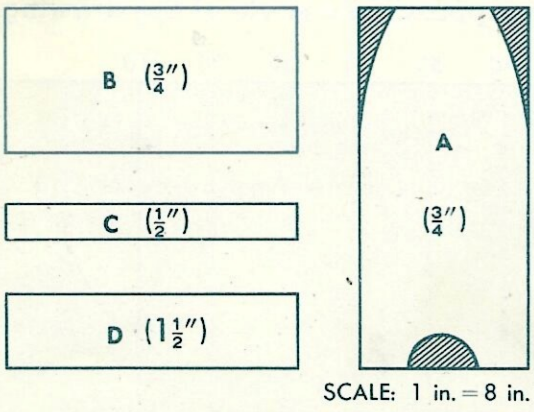
13. How long and how wide is each of the end zones?

14. Make what measurements you need to make. Figure out an approximate scale of the drawing.



Shop Plans

Dick and Ray are making shoeshine stands. Scale drawings of the parts are shown below. The thickness of each piece after it has been planed smooth is given in parentheses within the drawing.



SCALE: 1 in. = 8 in.

1. How many pieces of each kind are needed to make a stand?

2. What is the actual length of piece A? What is the actual width of piece A?

3. What are the actual lengths and widths of pieces B, C, and D?

4. What is the total height of the completed stand?

5. What is the total length of the completed stand?

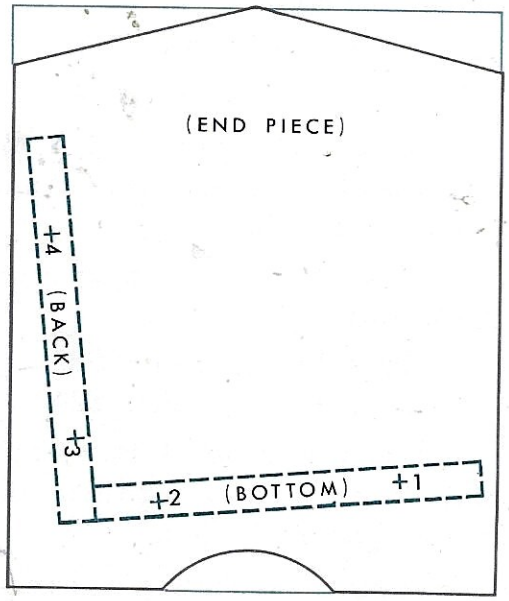
6. What is the length, width, and depth of the tray for brush and polish?

7. Large screws are used to fasten pieces A to piece D. All other screws used are small. How many large screws are needed? How many small screws are needed?

8. Dick has a board $\frac{7}{8}$″ by 7″ by 8′. Is this board suitable for pieces A and B? Explain.

How much of the board will be left when enough pieces A and B have been cut from the board to make two stands?

Bob and Jack are making bookracks. The scale drawing below shows one end of the rack, with dotted lines indicating the position of the bottom and back boards. The + 's show where screws are to be placed to fasten the ends. The inside length of the rack is to be 24 inches.



SCALE: 1 in. = 4 in.

9. What is the width of the bottom board? Of the back board?

10. What is the thickness of the bottom and back boards?

11. What is the length and the width of a board needed to make one end of the bookrack?

12. Screw 1 is 2 in. from the front edge of the end and $2\frac{1}{4}$ in. from the bottom. Find the exact position of each of the other screws.

13. How much lower is the back of the shelf than the front of the shelf?

14. On a large sheet of paper, make a full-size drawing of the end of the bookrack.

15. The shop teacher has a board $\frac{3}{4}$″ by 8″ by 12′. How many 24-in. boards can be cut from it? For how many racks will this supply bottom and back boards?

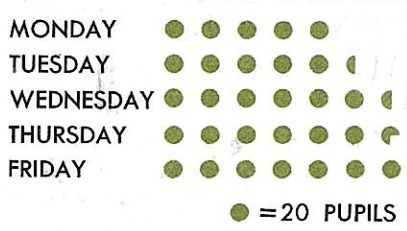
16. Will a board $\frac{3}{4}$″ by 10″ by 12′ be enough to make end pieces for 6 bookracks? Explain.

17. How many board feet of lumber are needed to make one bookrack? (The end pieces are made of $\frac{3}{4}$-inch boards.)

18. The lumber for the bookracks costs 21¢ per board foot. Jack says that the lumber needed for one rack will cost 91¢. Check to see whether or not he is correct.

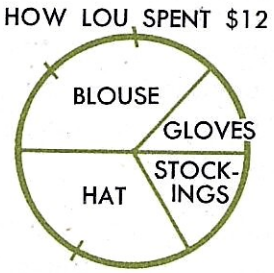
How Well Have You Learned?

1. Make a table that tells the number of pupils that ate in the school lunchroom each day.

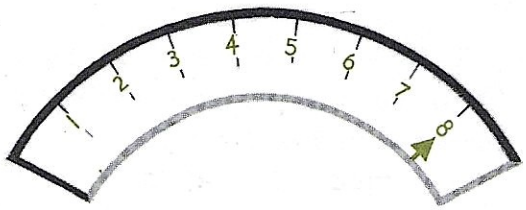


2. How much did Ray spend for shoes? How much for the hat? How much for the tie?

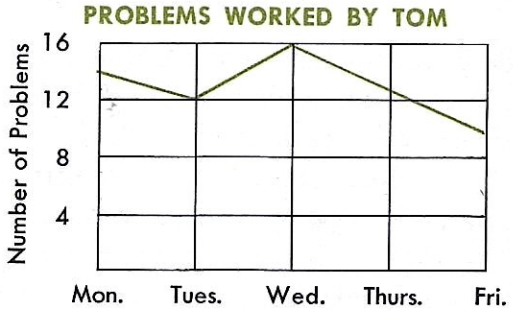
3. The top half of the circle is marked into four equal parts. The bottom half is marked into three equal parts.



How much did Lou spend for gloves? For hat? For blouse? For stockings?



4. Make a chart that tells how many problems Tom did each day.



5. This table shows the number that attended a boys' club for a 5-week period.

WEEK	1st	2nd	3rd	4th	5th
NO.	8	16	20	12	16

Make a rectangular graph $4\frac{1}{2}''$ long and $\frac{1}{2}''$ wide to show attendance at the club.

6. Make a bar graph to show these costs.

Shoes	$16	Suit	$32
Hat	$ 8	Other	$24

7. Use the scale, 1 in. = 40 ft. Make a drawing of a garden 100 ft. long and 60 ft. wide.

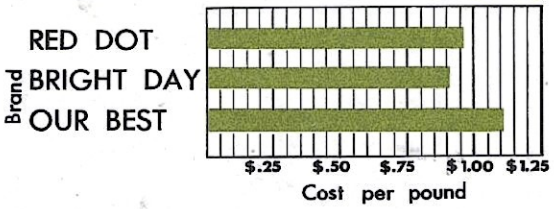
8. A map has the scale, 1 in. = 40 mi. The map distance between two cities is $2\frac{3}{8}$ in. What is the actual distance?

Help Yourself to Improve

1. Make a bar graph to show the weights of the Hill family. (198, 199)

Mr. Hill 200 lb. Mary 75 lb.
Mrs. Hill 150 lb. John 50 lb.

2. Make a table showing the cost per pound of the different kinds of coffee. (197)



3. Make a line graph to show Betty's scores on her weekly arithmetic tests.

1st Week–8 2nd Week–10
3rd Week–7 4th Week– 9

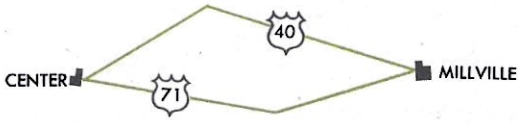
4. A certain kind of material is .5 cotton; .3 linen; and .2 rayon. Show these facts in a rectangular graph $2\frac{1}{2}$ in. long and $\frac{1}{2}$ in. wide. (206)

5. Jane allows 8 hr. a day for sleep; 4 hr. for dressing and eating; 9 hr. for school and home study; and 3 hr. for other things. Show these facts in a circle graph. (205)

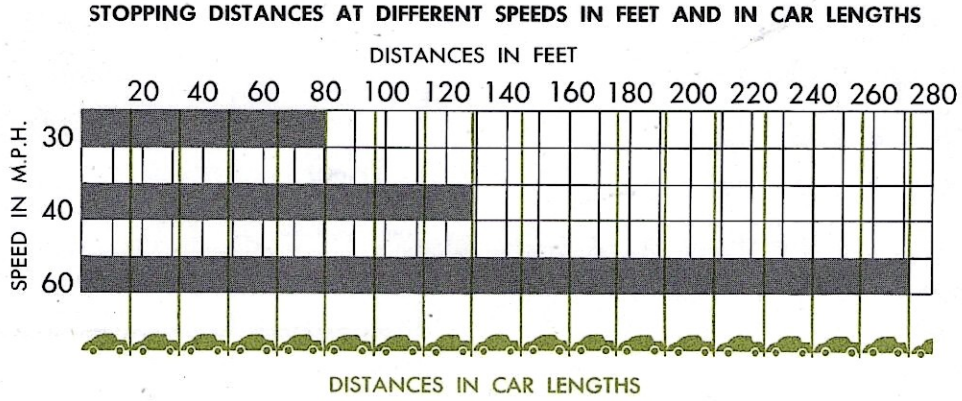
THINK: 8 hr. is $\frac{1}{3}$ of a day, and $\frac{1}{3}$ of 360° is 120°.

6. Make a scale drawing of a rectangular table top 30″ × 24″. Use a scale of 1″ = 12″. (213)

7. The drawing below shows two roads connecting Center and Millville. The scale of the map is 1″ = 40 mi. Which road between the two towns is the shorter? What is the difference in miles? (212)



8. Tell two facts shown in the graph below. (197)


STOPPING DISTANCES AT DIFFERENT SPEEDS IN FEET AND IN CAR LENGTHS
DISTANCES IN FEET
20 40 60 80 100 120 140 160 180 200 220 240 260 280
SPEED IN M.P.H.
30
40
60
DISTANCES IN CAR LENGTHS

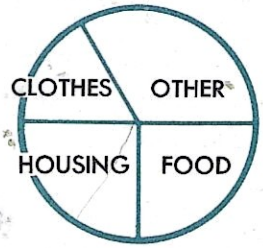
Show That You Know

1. On a certain map, 1 inch stands for 120 miles. How many miles are represented by each of the following map distances?

$\frac{1}{2}''$ $\frac{7}{8}''$ $1\frac{1}{4}''$ $2\frac{1}{2}''$ $\frac{3}{4}''$ $6\frac{1}{4}''$

2. Joan made a scale drawing of a garden 80 ft. long and 60 ft. wide. What scale did Joan use if the drawing was 4 in. long? How wide was the drawing?

3. This circle graph tells how Mr. and Mrs. Martin use their money.



What fractional part of their money is used for food? For clothes? For housing? For other expenses?

4. Make a bar graph showing \$300, \$500, \$250, and \$450. Let 1 in. of bar stand for \$200.

5. This is a picture graph of Jim's wages for May and June.

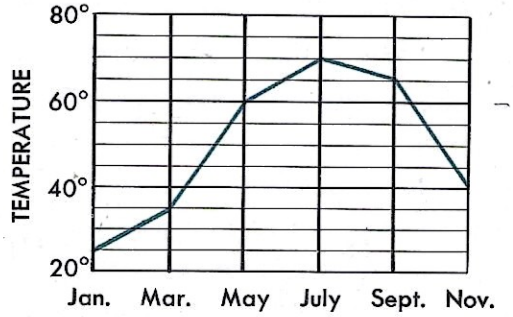
May ● ● ● ● ● ●

June ● ● ● ● ● ● ●

● = 30¢

What were Jim's wages in May? In June?

6. This line graph tells the average temperature in a certain city for different months.



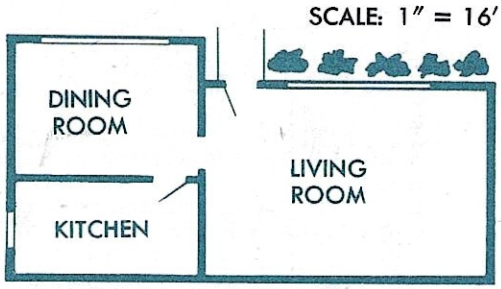
Tell two facts that are shown in the line graph above.

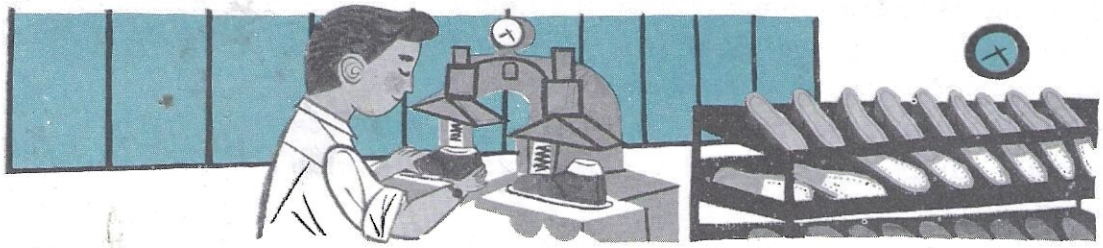
7. The population of a town was divided by age groups as follows:

Below 20 years	35%
20 to 50 years	45%
Over 50 years	20%

Make a rectangular graph showing these figures.

8. A portion of the plan for a ranch-type house is shown below. The scale used was 1″ = 16 ft. What are the dimensions of each of the rooms that are shown?





Figuring Wages

Mr. Hall was to begin work at a shoe factory. At other jobs, he had been paid by the hour. In the shoe factory, he would be paid according to the "pieces" of work he finished.

Each operation in the shoe factory had a different piece rate. Heeling machine operators received 15¢ per dozen heels nailed on. Buckle sewing machine operators were paid $7\frac{3}{4}$¢ per dozen. Leather cutters received 27¢ per dozen shoes cut out. All workers were guaranteed a minimum of $1 per hour.

1. Mr. Hall was hired to attach heels. One week he averaged 100 dozen per day. He worked 8 hours a day for 5 days. How much did he earn that week? What was his average pay per hour?

2. The first week (40 hr.), while he was learning to operate his heeling machine, Mr. Hall had completed only 392 dozen. What was his total pay that week? How much did he average per hour?

3. Figure the wages for 40 hours for "heelers" who produced the following amounts: 540 doz.; 448 doz.; 488 doz.; 504 doz. What did each worker average per hour?

4. In five weeks Mrs. Alt sewed the following amounts of buckles: 528 doz.; 540 doz.; 592 doz.; 600 doz.; 660 doz. Find her wages for each of these weeks.

5. Mr. Meyer cut leather for men's shoes. Figure his wages for each week (40 hr.), when he averaged the following amounts: 60 doz. per day; 330 doz. per week.

6. Who earned the highest hourly wage, a worker who attached 100 doz. heels per day (8 hr.), one who sewed on 120 doz. buckles per day, or one who cut 60 doz. men's shoes per day?

Punching a Time Clock

In most factories, each worker has a time card. The time clock stamps on the card the time the worker begins work, the time he leaves for lunch and the time he returns, and the time he quits for the day. The weekly payroll is made from the times stamped on the card.

NAME Don Miller	
WK. ENDING May 8	
8:00 MAY 4	IN
12:00 MAY 4	OUT
1:00 MAY 4	IN
5:00 MAY 4	OUT
8:30 MAY 5	IN
11:30 MAY 5	OUT
1:00 MAY 5	IN
4:30 MAY 5	OUT
8:00 MAY 6	IN
12:00 MAY 6	OUT
1:15 MAY 6	IN
4:30 MAY 6	OUT
9:00 MAY 7	IN
12:30 MAY 7	OUT
1:30 MAY 7	IN
4:30 MAY 7	OUT
8:00 MAY 8	IN
12:00 MAY 8	OUT
1:00 MAY 8	IN
5:30 MAY 8	OUT

1. How many hours did Don Miller work each day? In the whole week? At \$1.12 per hour, what did he earn in that week?

2. Mr. Davis works regularly from 8 A.M. to 4:30 P.M., with a half hour out for lunch. At \$1.17$\frac{1}{2}$ per hour, what is his daily pay?

3. Mr. Lewis punches in on the time clock at 3 P.M. and works until 11:30 P.M., with 30 minutes out for lunch. He is paid \$1.27$\frac{1}{2}$ per hour. What is his daily pay?

Eight hours is usually considered a full day's work. When a worker works longer, he is paid for *overtime.* Overtime pay usually is $1\frac{1}{2}$ times the regular rate. We say that the worker is paid "time and a half" for overtime. Explain.

4. Mr. Hale earns \$1.00 per hour. One day he worked 9 hours and was paid \$9.50. Explain.

5. Mr. Dunn is paid \$1.20 per hr. What does he earn in a week in which his time card shows 8 hr., 7 hr., $8\frac{1}{2}$ hr., $9\frac{1}{4}$ hr., and 10 hr.?

6. The table in the next column gives the number of hours worked per day by 9 workers, and their hourly rate. How much did each worker earn during the week?

NAME	MON.	TUES.	WED.	THUR.	FRI.	RATE
M. B.	$7\frac{1}{2}$	8	8	$6\frac{1}{2}$	$7\frac{1}{4}$	\$1.04
F. C.	9	$6\frac{1}{4}$	$7\frac{1}{2}$	$9\frac{1}{4}$	10	\$1.12
J. K.	7	8	9	$8\frac{1}{2}$	$9\frac{1}{2}$	\$1.36
C. M.	$8\frac{1}{4}$	5	$6\frac{1}{4}$	9	$8\frac{1}{2}$	\$1.44
T. R.	9	$9\frac{1}{2}$	10	$6\frac{1}{2}$	9	\$1.60
W. J.	$8\frac{1}{2}$	$10\frac{1}{4}$	$6\frac{1}{2}$	7	8	\$1.68
P. W.	$9\frac{1}{2}$	$7\frac{1}{4}$	5	$10\frac{1}{4}$	9	\$1.38
L. M.	$8\frac{1}{2}$	$6\frac{1}{2}$	$9\frac{1}{4}$	10	$8\frac{1}{4}$	\$1.52
W. T.	$7\frac{1}{4}$	$8\frac{1}{2}$	9	$7\frac{1}{2}$	$10\frac{1}{4}$	\$1.76

Mixed Practice

The time clock does its work correctly. The clerk who figures wages from the time cards must do his job well, too. The worker must check to see that his pay is right. This page is good practice for anyone who will figure for others or figure for himself.

1.

3	87	328	$4.25	6.318
8	9	46	6.17	.672
7	16	133	9.83	.046
4	24	98	.98	.009
9	9	492	.94	.927
2	31	7	.17	7.030
+5	+5	+118	+10.22	+4.066

2. $36+47+92+18+17+28+33$

3. $.04+3.16+1.00+9.35+.91$

4. $563+19+43+8+219+500$

5. $\$1.67+\$.48+\$37+37¢+5¢$

6. $3.18+.46+.09+57.14+.06$

7.

4018	8043	$16.29	7.15
−2935	−3049	−9.37	−.87

8. $20.20-16.85$ $\quad 1.31-.83$

9. $73.00-18.05$ $\quad 6.40-.77$

10. $103{,}602-80{,}005$

11. $201{,}302-97{,}145$

12.

54	973	8466	$15.19
×36	×48	×93	×6

13.

73	1.36	93.4	$438.36
×40	×25	×35	×24

14.

87	26.2	43.8	$75.25
×9	×8.3	×6.8	×.36

15. $9\overline{)2718}$ $\quad 38\overline{)19192}$

16. $1.7\overline{)15.81}$ $\quad .58\overline{)226.2}$

17. $48\overline{)33696}$ $\quad 57\overline{)47900}$

18. $27\overline{)\$983.61}$ $\quad 32\overline{)\$658.24}$

19.

$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{5}$	$3\frac{1}{4}$	$2\frac{3}{4}$
$+\frac{3}{8}$	$+\frac{1}{4}$	$+\frac{1}{3}$	$+2\frac{1}{2}$	$+6\frac{2}{3}$

20.

$\frac{1}{6}$	$\frac{7}{8}$	$\frac{2}{3}$	$1\frac{1}{2}$	$3\frac{1}{3}$
$+\frac{2}{3}$	$+\frac{3}{4}$	$+\frac{1}{4}$	$+2\frac{3}{5}$	$+6\frac{7}{8}$

21. $1\frac{1}{2}+2\frac{1}{4}+1\frac{2}{3}+3\frac{5}{6}+7$

22. $3\frac{1}{3}+2\frac{4}{5}+2\frac{1}{2}+4+1\frac{1}{4}$

23. $5+6\frac{2}{3}+7\frac{1}{2}+3\frac{3}{4}+3\frac{1}{4}$

24. $8\frac{1}{3}+5\frac{1}{6}+3\frac{1}{2}+6\frac{1}{4}+12$

25. $5\frac{5}{6}+7\frac{1}{2}+8\frac{1}{3}+2\frac{1}{4}+20$

26. $3\frac{7}{8}-3\frac{1}{4}$ $\quad 219\frac{1}{2}-43\frac{15}{16}$

27. $7\frac{7}{16}-5\frac{3}{8}$ $\quad 42\frac{1}{6}-9\frac{7}{8}$

28. $16\frac{2}{3}-15\frac{13}{16}$ $\quad 97\frac{5}{16}-88\frac{5}{8}$

29.

338	$349\frac{1}{2}$	$288\frac{2}{3}$
$\times 12\frac{1}{5}$	×9	$\times 1\frac{1}{2}$

30. $4\frac{7}{8}\div\frac{3}{4}$ $\quad 718\frac{1}{2}\div 6$ $\quad 16\frac{2}{3}\div 2\frac{1}{2}$

Thrift in Spending

1. The sale price of the candy bars in the picture above is what fractional part of the regular price? The sale price is what per cent of the regular price?

Edith buys 12 candy bars a week. How much can she save by buying a week's supply at the sale price?

2. The Baker family uses 4 bars of toilet soap a week. The regular price is 10¢ a bar. The sale price is 12 bars for $1. How much can Mrs. Baker save if she buys enough soap for twelve weeks at the sale price?

3. Canned asparagus is 33¢ a can, or $3.50 for a dozen cans. How much can you save if you buy a dozen cans at one time?

4. Motor oil is 40¢ a quart, or $1.20 a gallon. What per cent is saved if you buy motor oil by the gallon?

5. Mrs. Carr needs two dozen towels. The price is 79¢ each, or $9 a dozen. How much can she save if she buys a dozen towels?

6. Apples are 15¢ a pound, or 4 lb. for 50¢. What is the per cent of saving when you buy 4 lb.?

7. Mrs. Hill needs 6 lb. of crackers. One store has the kind she wants at 2 lb. for 45¢. Another store has the same kind at 3 lb. for 59¢. Which is the lower price? How much can Mrs. Hill save if she buys the crackers she needs at the lower price?

8. Below are the prices of 4 different brands of tomato juice. There are 16 ounces in a pint. What is the cost per ounce for each can? If all cans are the same quality, which is the best bargain?

10 oz. can @ 6 for 51¢
1 pt. 4 oz. can @ 3 for 48¢
1 pt. 8 oz. can @ 3 for 54¢
3 pt. 2 oz. can @ 30¢ each

9. A small can (1 pt. 2 oz.) of

grapefruit juice is 15¢. A larger can (3 pt. 6 oz.) is 36¢. What is the price per ounce for each can?

10. The same quality coffee is 75¢ a pound, or a 3-pound bag for $2.07. What is the per cent of saving when you buy a 3-pound bag?

11. Coal is $18.75 a ton in August. The price will be 8% higher in September. How much can one save by purchasing 8 tons of the coal in August rather than in September?

12. Earl's mother bought a chair at 15% discount. The marked price was $64. How much did Earl's mother pay for the chair?

▶ Most stores have sales of high quality goods at various times of the year. The buyer saves by waiting for these sales if he is sure he is buying from a reliable company. The unreliable store will use a "sale" to get rid of inferior goods.

13. The regular price of a boy's suit was $48. The sale price was 20% less. What was the sale price?

14. Bill saved 50¢ by purchasing a pair of gloves at a sale. The sale price was 25% less than the regular price. What was the regular price? Check your answer.

15. A jewelry store sold many items at 50% off the marked price. The marked price of a watch was $37.50. What was the sale price?

16. Ann paid $15 for a ring. This was $\frac{1}{4}$ off the marked price. What was the marked price?

17. Sugar is 12¢ a pound in 1-pound boxes. It is 90¢ for a 10-pound bag. Mrs. Ames uses 20 lb. a month. How much can she save on sugar each month if she buys it in 10-pound bags?

18. A case of pears (24 cans) costs $5.79. One can costs 30¢. How much can be saved by buying a case at a time rather than buying the pears one can at a time?

19. A furniture store gives a 15% discount if goods are paid for in cash. Mrs. Wood bought a living room set marked $340, a refrigerator marked $215, and a cedar chest marked $78. How much can she save by paying cash?

20. Coal in August was $17.50 a ton. The same coal was $19 a ton in September. Mr. Walker will use 12 tons of coal during the winter. How much can he save if he buys in August?

Mixed Practice

The sales person as well as the wise shopper must figure quickly and accurately. Use the examples on this page to get practice in figuring quickly and accurately.

Add.

1. $\frac{1}{4}+\frac{1}{2}+\frac{3}{8}+\frac{7}{16}+\frac{1}{8}$
2. $\frac{1}{3}+\frac{1}{2}+\frac{5}{6}+\frac{2}{3}+\frac{5}{12}$
3. $\frac{2}{3}+\frac{3}{4}+\frac{1}{6}+\frac{5}{8}+\frac{7}{12}$
4. $\frac{3}{5}+\frac{2}{3}+\frac{1}{2}+\frac{1}{4}+\frac{5}{6}$
5. $3\frac{1}{3}+4\frac{1}{2}+6\frac{1}{4}+1\frac{5}{6}$
6. $7\frac{1}{2}+6\frac{2}{3}+6\frac{1}{4}+8\frac{1}{3}$

Subtract.

7.	$\frac{7}{8}$	$\frac{2}{3}$	$5\frac{5}{6}$	$7\frac{1}{2}$
	$\frac{1}{8}$	$\frac{1}{2}$	$1\frac{1}{6}$	$2\frac{3}{4}$
8.	$\frac{4}{5}$	$\frac{5}{6}$	$8\frac{1}{3}$	$7\frac{1}{2}$
	$\frac{1}{6}$	$\frac{3}{4}$	$2\frac{5}{6}$	$6\frac{2}{3}$
9.	$\frac{7}{8}$	$\frac{3}{4}$	$1\frac{4}{5}$	$7\frac{1}{2}$
	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{2}$	2
10.	$\frac{5}{6}$	$\frac{5}{8}$	4	$8\frac{1}{3}$
	$\frac{1}{2}$	$\frac{1}{4}$	$1\frac{2}{3}$	$6\frac{3}{4}$

Multiply.

11.	$\frac{2}{3}\times\frac{3}{4}$	$1\frac{2}{3}\times 3$
12.	$\frac{5}{8}\times\frac{4}{5}$	$5\times 3\frac{4}{5}$
13.	$\frac{3}{16}\times\frac{2}{3}$	$6\frac{2}{3}\times 1\frac{1}{2}$
14.	$3\frac{3}{4}\times 2\frac{1}{2}$	$1\frac{3}{5}\times 4\frac{1}{2}$
15.	$12\frac{1}{2}\times 5\frac{1}{3}$	$3\frac{1}{3}\times 1\frac{1}{5}$
16.	$4\times 112\frac{1}{2}$	$2\frac{1}{2}\times 496$

Divide.

17.	$\frac{3}{4}\div\frac{3}{8}$	$33\frac{1}{3}\div 4$	$3\frac{3}{4}\div 2\frac{1}{2}$
18.	$8\div 2\frac{2}{3}$	$26\div 1\frac{5}{8}$	$8\frac{1}{3}\div 5$
19.	$\frac{5}{6}\div\frac{1}{2}$	$17\frac{1}{2}\div 1\frac{3}{4}$	$\frac{5}{6}\div\frac{2}{3}$

Write these per cents as fractions.

20.	20%	25%	50%	75%
21.	$12\frac{1}{2}\%$	$37\frac{1}{2}\%$	$62\frac{1}{2}\%$	$87\frac{1}{2}\%$
22.	$33\frac{1}{3}\%$	$16\frac{2}{3}\%$	$66\frac{2}{3}\%$	$83\frac{1}{3}\%$
23.	$8\frac{1}{3}\%$	$6\frac{1}{4}\%$	$6\frac{2}{3}\%$	5%

Write these fractions as per cents.

24.	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{3}{8}$	$\frac{4}{5}$	$\frac{7}{10}$
25.	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{2}{5}$	$\frac{5}{8}$	$\frac{5}{6}$	$\frac{3}{16}$
26.	$\frac{1}{8}$	$\frac{2}{3}$	$\frac{3}{5}$	$\frac{7}{8}$	$\frac{1}{16}$	$\frac{3}{4}$

Write as per cents.

27.	.05	.5	.16	.25	.38
28.	.01	.6	.09	.20	.45

Write as decimals.

29.	5%	15%	150%	50%
30.	1%	10%	100%	200%

Find the missing numbers.

31. 15 is ☐% of 75 — 2 is ☐% of 6
32. 25% of ☐ = 4 — 75% of ☐ = 12
33. 200% of 8 = ☐ — 5% of 81 = ☐
34. 15% of 20 = ☐ — 1.5% of 20 = ☐
35. .8% of 72 = ☐ — 4.1% of 40 = ☐

No Pencils, Please

Everyone needs to know how to figure without writing numbers on paper. The problems on this page give practice in figuring the answers mentally. Choose the best answer from the numbers in parentheses. Use your pencil to write answers only.

1. Study the map below. About how many miles is it from Albion to Carmel? (120; 140; 160)

2. At 15 mi. to the gallon, how many gallons of gasoline are needed to drive from Bedford to Carmel? ($4\frac{2}{3}$; $7\frac{1}{3}$; $8\frac{5}{6}$)

3. At 2¢ a mile, what is the approximate cost of the gasoline needed to drive from Albion to Bedford? ($4.20; $6; $7.50)

4. What is the approximate cost of 7 yd. of material at 49¢ a yard? ($2.83; $3.50; $4.90)

5. Four different items cost 38¢, 53¢, 49¢, and 22¢. Find the approximate total cost. ($1.60; $1.35; $1.20)

A factory elevator is marked, "Safe Load Not More than 3000 Pounds."

6. Women workers average 140 lb. How many women can be on the elevator at one time? (8; 16; 21)

7. Men workers average 180 lb. How many men can ride safely on the elevator at one time? (8; 16; 21)

Ben's truck will haul up to 2 tons of livestock.

8. How many 750-pound calves can Ben haul at one time? (3; 5; 7)

9. How many 90-pound lambs can Ben haul at one time? (20; 35; 44)

10. A wading pool is a rectangle 6 ft. long, 5 ft. wide, and 1 ft. deep. Using $7\frac{1}{2}$ gal. = 1 cu. ft., how many gallons will the pool hold? (4; 65; 225)

SCALE: 1 in. = 40 mi.

SMITH'S GROCERY STORE
Mounds, Ky.

To: Mrs. John Boggs
512 Adams St.

Aug. 1 19__

Carried forward			22	16
Lamb roast	3	27		
Ham	4	16		
Eggs	1	32		
Butter		75		
Coffee		83		
Sugar		89		
Bread		38		
Oranges		55	12	15
TOTAL AMOUNT DUE				

Compton's Department Store
Drummond, Michigan

SOLD TO: Mrs. Al. Hensel
715 Chandler St.
City

Dept.	Clerk	Date	How Sold	Amount received
16	13	8/12	cash	20.00

3	yd. muslin	1	95
5	spools thread		50
2	doz. buttons		75
1	pr. shoes	7	95
1	blouse	3	49
		14	64

SEND TO: Mrs. Al. Hensel
715 Chandler St.
City

Dept.	Clerk	Date	How Sold	Amount
16	13	8/12	cash	14.64

Business Forms

1. Mrs. Boggs owed Smith's Grocery Store $22.16 from last month. This is entered on her sales slip as "Carried Forward." She bought goods amounting to $12.15 on August 1. The amount carried forward plus the cost of the August 1 purchases is the total amount due. How much is this?

2. On a sales slip, the space in which a number is written tells whether it means dollars or cents. The clerk does not write a dollar sign or decimal point in making out a sales slip. Can you think of reasons for doing it this way?

3. Draw a grocery sales slip. Supply names for store and customer. Use today's date. Show $13.87 as amount carried forward. The different items bought cost $1.85; $.93; $3.46; $.82; $.15; $.55. Supply names for these items so that costs are reasonable. Find the total cost of the goods bought today and the total amount due.

4. Study the sales slip from Compton's Department Store. On

what date did Mrs. Hensel buy the goods? Is there a record of which clerk sold the goods?

What was the total cost of the goods Mrs. Hensel bought? Was it a cash or charge purchase? How much money did Mrs. Hensel give to the clerk? How much change should Mrs. Hensel get back?

5. Draw a department store sales slip. Supply the name of the store and of the customer. Use today's date. The different items bought cost $15.95; $.85; $1.79; $30; $4.75. Supply names for these items so that the costs are reasonable. Have the customer give the clerk three 20-dollar bills in payment of goods.

What is the total cost of the goods bought? How much change will the customer get back?

6. The business form at the bottom of the first column is a bill. Notice that it states that discount will be given for prompt payment. Copy this form with space at right for totals.

Multiply to find the whole cost of each item. Add the costs of the different items. What is the total? How much can Smith's Grocery save by paying the bill within 10 days?

7. The bill at the bottom of this column uses three terms that are often used in business: *list price*, *discount*, and *net price*. Study the bill carefully and explain what list price and net price mean.

8. Find the net price of each item on the bill below. Find the total net price.

RICE and CO. FOOD BROKERS
Cincinnati, Ohio

September 15, 19__

Sent to: Smith's Grocery Store
Mounds, Kentucky

2% discount if paid within 10 days

NO. CASES	ITEM	PER CASE	PRICE
2	apricots	$4. 80	
4	peaches	3. 15	
2	peas	5. 30	
6	tomatoes	2. 70	

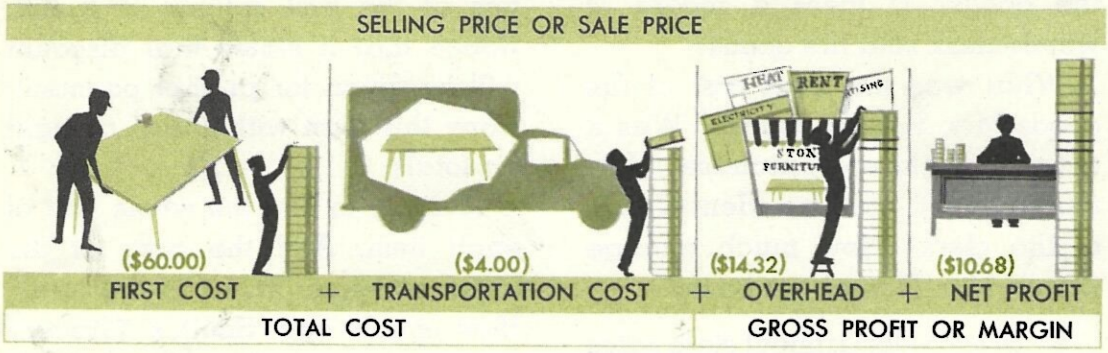
SHELL MANUFACTURING CO.
Chicago, Illinois

November 17, 19__

Sold to: Tim's Appliance Co.
Hanover, Indiana

	List Price	Discount	Net Price
1 Coffee Maker	22. 50	20%	$18. 00
1 Food Mixer	27. 50	25%	
1 Toaster	18. 75	20%	
1 Deep Fryer	24. 00	15%	
1 Steam Iron	14. 90	30%	

Important Business Terms



1. Study the pictures and the graph at the top of this page. Explain the meaning of the following terms: *first cost, transportation cost, total cost, gross profit* or *margin, net profit, selling price* or *sale price* How much is each of these?

2. Mr. Stone's gross profit on a table was $25. Besides profit for Mr. Stone, the gross profit had to cover the table's share of *overhead;* that is, the cost of rent, heat, light, upkeep of the store, the expense of showing and selling, and the expense of making deliveries. Mr. Stone figured that the table's share of the overhead amounted to $14.32. What was his net profit on the table?

3. Mr. Stone's net profit was what per cent of the selling price?

THINK: $\frac{\text{Net Profit}}{\text{Selling Price}} = \blacksquare\,\%$

■ **To find the per cent of net profit, divide the net profit by the selling price.**

4. Mr. Stone bought a sofa for $115. The transportation from factory to store was $13. The overhead was $12. He sold the sofa for $175. Find the total cost, the margin, the net profit, the sale price, and the per cent of net profit.

5. The total cost of a bedroom set was $105. The overhead was $15. Mr. Stone marked the selling price so that his margin would be $30. What was the marked price?

6. The total cost of a cabinet was $120. The selling price was $150. What was the margin? What per cent was the margin of the selling price?

7. The list price of a dining set was $400. The factory offered discounts of 20% and 10%. What was

the net price of the dining set? Explain each step below.

List Price	$400	
First Discount	−80	(20% of $400)
	320	
Second Discount	−32	(10% of $320)
Net Price	$?	

8. Prove that one discount of 30% is not the same as two discounts of 20% and 10%. Can you see why it is important, when there are two or more discounts, to find them one at a time?

9. The list price of a radio was $150. There were discounts of 20% and $16\frac{2}{3}\%$. What was the net price?

▶ Discounts offered to retail stores by factories and wholesalers are called *trade discounts*. There may be a discount for cash in addition to trade discounts.

10. The list price of a TV set is $240. The factory offers trade discounts of $16\frac{2}{3}\%$ and $12\frac{1}{2}\%$, and a cash discount of 2% if the bill is paid within 10 days. What is the net price if the bill is paid within 10 days?

11. Make up and solve a problem in which a dealer receives two trade discounts plus a cash discount. Make certain that your figures are sensible.

12. Make up and solve a problem which makes use of total cost, gross profit, and net profit.

13. Make up and solve a problem in which you find what per cent the net profit is of the selling price.

▶ At regular intervals, business firms take *inventory* of their goods. To take inventory means to count and record the goods on hand.

14. Mr. Stone made an inventory a month ago. It showed that the total marked price of the goods in his store was $12,275. During the month, he has brought in goods with total marked price of $4800. He has sold goods with total marked price of $5150. What should be the total marked price of his inventory this month?

15. Give several reasons why a business firm should take inventory of the goods it has.

▶ When dealers want to get rid of goods they have on hand, they have sales in which they offer discounts to their customers.

16. At a month-end sale, Mr. Stone offered 15% discount on rugs. What is the sale price of a rug marked $108?

JANE WALKER'S PERSONAL ACCOUNT

Received			Spent		
Aug.			Aug.		
1	Cash on hand	$5.40	3	Pink ribbon	$ .75
4	Baby-sitting	1.00	7	Church	.25
9	Help Mrs. Lee	1.50	9	Carfare	.40
12	Help Daddy	2.00	16	Haircut	.75
18	Baby-sitting	1.00	22	Savings account	3.00
26	Sold book	.75	26	Lunch	.45
	Total			Total	
Sept.					
1	Cash on hand				

Personal and Family Accounts

A person or family should keep an account of money received and money spent. This will tell whether the plan of spending, or budget, is working.

1. Study Jane Walker's personal account at the top of the page. Find the total received, the total spent, and cash on hand.

2. Find the total received, the total spent, and cash on hand in the Walker family account below.

3. Tom Walker is treasurer of a boys' club. They have dues. They spent their money for their club house and for sports goods. Make an account for the club for the month of June.

ACCOUNT OF THE WALKER FAMILY

Received			Spent		
May			May		
1	Cash on hand	$61.20	4	Groceries	$13.42
4	Commission	25.00	7	Meat	4.75
6	Wages	36.00	12	Shoe repair	1.35
10	Sold dog	8.00	18	Groceries	15.71
18	Commission	21.50	23	Meat	3.43
24	Wages	32.00	28	Suit	21.89
	Total			Total	
June					
1	Cash on hand				

Business Accounts

Businesses keep accounts, too. The account below shows the income of a large gas and electric company, and how the income was used.

INCOME FOR THE PAST FISCAL YEAR	
Sales of Electricity	$94,000,000
Sales of Gas	3,000,000
Other	3,000,000

HOW INCOME WAS USED	
Wages	$35,000,000
Fuel	22,000,000
Taxes	21,000,000
Replacing Equipment	12,000,000
Other Costs	2,000,000
Profit	8,000,000

1. What was the total income of the electric company? What per cent of the total income came from each of the items listed?

2. What is the total of the income that was used? What per cent of this was used for wages? For taxes?

Betty sells coffee in a super market. She keeps an account for each brand of coffee she sells.

At the end of the day she adds the number of pounds in stock in the morning and the number of pounds received that day. From this sum she subtracts the number of pounds sold. This gives her the number of pounds in stock the next day.

This is Betty's account for one brand of coffee.

	MONDAY	TUESDAY
In stock	28 lb.	33 lb.
Received	48 lb.	36 lb.
Sold	43 lb.	45 lb.

3. Copy Betty's account. Continue it through Saturday. Use these figures:

DAY	RECEIVED	SOLD
WED.	48 lb.	44 lb.
THU.	48 lb.	34 lb.
FRI.	24 lb.	46 lb.
SAT.	60 lb.	54 lb.

4. How many pounds did Betty have in stock on Wednesday? Thursday? Friday? Saturday?

5. Counting the coffee in stock on Monday, and the total received in the week, how many pounds did Betty have in all? How many pounds did she sell? How many pounds did she have left at the end of the week? Does this check?

6. Betty keeps account of money from coffee sold. Find the amount received from coffee sold on Monday:

43 lb. of brand A @ 88¢ lb.
29 lb. of brand B @ 92¢ lb.
56 lb. of brand C @ 74¢ lb.

Problem Solving

One or more necessary facts are missing from each of the following problems. Tell what facts are missing and what processes to use in solving each problem. Do not solve the problems now.

1. A grocer sells rice in half-pound packages. At this price, what is the cost per pound?

2. Three pieces of ribbon are sewed together. The seams use up 2 in. How long is the whole piece?

3. Mary gave mother some apples. Mother ate one and made a pie with some. How many apples were left?

4. What is the cost of a dozen oranges, a pound of ground beef, and a peck of potatoes?

5. How much candy should we have in order to give each child one-half pound?

6. What is the cost of enough dog biscuits to feed Fido for a month?

7. Jane eats the same number of apples each day. How long will it take her to eat a bag of apples?

8. Miss Bailey divided a box of apples equally among all the children. How many apples did each child get?

Supply a sensible fact for each of the problems in the first column. Solve the problems.

Difficult numbers may make a problem seem harder than it is. It is helpful first to work another problem like the one that seems hard except with simple numbers. Solving the simple problem gives you a pattern for solving the problem that seems hard.

9. How many pieces of ribbon each $2\frac{5}{8}$ in. long can be cut from a piece of ribbon $5\frac{1}{4}$ ft. long?

THINK: If I substitute 3 in. for $2\frac{5}{8}$ in. and 5 ft. for $5\frac{1}{4}$ ft., I can work like this: 5×12 in. $= 60$ in.; $60 \div 3 = 20$ pieces.

10. You use $6\frac{1}{4}$ yd. of material in making $2\frac{1}{2}$ drapes. How many yards are needed for 8 drapes?

THINK: If it would take 6 yd. to make 2 drapes, how could I find how many yards are needed for 8 drapes?

11. John plowed $16\frac{7}{8}$ acres in $2\frac{1}{2}$ days. How many acres can he plow in $3\frac{1}{3}$ days?

12. A can of evaporated milk weighs $14\frac{1}{2}$ oz. How many cans can be filled with 58 lb. of evaporated milk?

13. A $15\frac{1}{4}$-pound turkey cost $9.76. What was the cost per pound?

Tom belongs to a 4-H group. This year he plans to raise tomatoes for his project. These are some of the problems he has to consider.

14. Tom's garden is 12 ft. wide by 18 ft. long. How many square feet is this?

15. Use the scale, 1″ = 4′. Make a scale drawing of Tom's garden.

16. With the first row $1\frac{1}{2}$ ft. from an end, Tom makes rows 3 ft. apart across the garden. How many rows will there be? Draw lines to show them on the scale drawing.

17. Tom will set the tomato plants $2\frac{1}{2}$ ft. apart, with the first one in each row 1 ft. from the end. How many plants will there be in a row? Show each plant with an x on the scale drawing.

Tom wanted to find out how many pounds of tomatoes he might expect to get from each plant. The 4-H Club director gave him the table in the first column.

AVERAGE YIELD OF VARIOUS TYPES OF TOMATO PLANTS

NAME	POUNDS	NAME	POUNDS
Break O'Day	12.5	Ponderosa	6.8
Oxheart	9.9	Belmont	6.4
Baltimore	7.4	Marglobe	5.2

18. Tom set out 30 Break O'Day plants. If his plants bear as well as the average given in the table, how many pounds will he get?

Count 60 lb. of tomatoes as a bushel. How many bushels of Break O'Day tomatoes does Tom expect to raise?

At $1.20 a bushel, how much will Tom get for his Break O'Day tomatoes?

19. How many tomatoes are on a Belmont plant if their average weight is 4 oz.? 8 oz.?

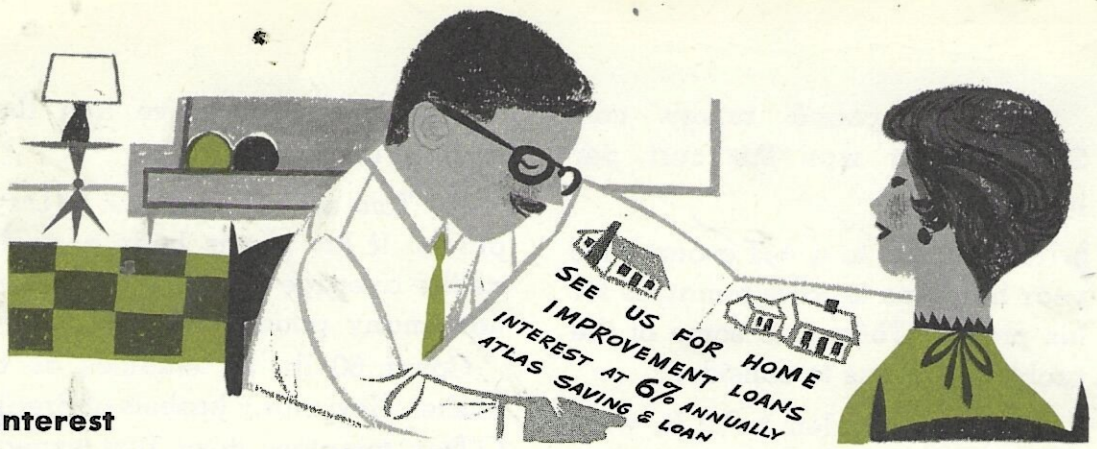
20. How many tomatoes are needed to make a bushel if their average weight is 5 oz.? 8 oz.?

21. Oxheart tomatoes often weight 2 lb. each. How many of these tomatoes are needed to make a bushel?

22. Ponderosa tomatoes often weigh 24 oz. each. How many of these tomatoes are needed to make a bushel?

23. According to the table, how many bushels could Tom expect to get from 30 Baltimore plants?

24. Marglobe tomatoes average 5 oz. each. How many Marglobe tomatoes will make 15 lb.?



Interest

1. After reading the above advertisement, Mr. Snow borrowed $750 for repairs on his home. What amount did he owe at the end of one year? Explain the work below.

$750	Principal
× .06	Rate of interest
$45.00	Interest for 1 yr.
750.00	
$795.00	Amount owed at end of 1 yr.

2. Explain what is meant by each of these terms: *principal, interest, rate,* and *amount.* If you have trouble, study page 114.

3. Mr. Siler needed money to buy a truck. He borrowed $750 for 2 years at 6%. What was the interest for the two years?

4. Mr. Taylor needed money to make a down payment on a car. He borrowed $750 at 6% for 4 mo. How much was the interest?

THINK: 4 months equal what fraction of a year?

▶ Remember that, unless otherwise stated, the interest rate is for 1 year. The interest period may be for a part of a year, or for more than a year.

5. Explain the formula below.

$i = p \times r \times t$ or $i = prt$

6. Use the formula to help you find the interest on $600 at 4% for 2 years. For 6 months.

Principal, rate, and time are given. Use the formula to help find the interest in each example below.

	PRINCIPAL	RATE	TIME
7.	$300	6%	1 yr.
8.	$500	3%	3 yr.
9.	$800	5%	6 mo.
10.	$450	6%	2 mo.

11. Using the principal and the time given in example 8, find the interest when the rate is $2\frac{1}{2}$%.

THINK: i = $500 × .025 × 3

12. Using the principals and times given in examples 9 and 10, find the interest when the rate is $2\frac{1}{2}\%$. When the rate is $4\frac{1}{2}\%$.

Find the interest on —

13. \$300 at $6\frac{1}{2}\%$ for 1 yr., 6 mo.

14. \$450 at $2\frac{1}{2}\%$ for 8 mo.

15. \$400 at $2\frac{1}{4}\%$ for 9 mo.

16. \$750 at $3\frac{1}{2}\%$ for $2\frac{1}{2}$ yr.

17. \$600 at $2\frac{3}{4}\%$ for $2\frac{1}{4}$ yr.

18. \$150 at $4\frac{1}{2}\%$ for 4 mo.

19. \$800 at $6\frac{1}{4}\%$ for 1 yr., 9 mo.

20. \$650 at $4\frac{1}{4}\%$ for $\frac{1}{2}$ yr.

21. What is the interest on \$240 at 4% for 9 months? Explain how cancellation was used as a short-cut way to find the interest in the example below.

$$\frac{\$240}{1} \times \frac{4}{100} \times \frac{3}{4} = \frac{\$36}{5} = \$7.20$$

22. Find the interest on \$600 at $2\frac{1}{4}\%$ for 24 days.

THINK: $2\frac{1}{4}\% = \frac{2\frac{1}{4} \times 4}{100 \times 4} = \frac{9}{400}$

$$\frac{\$600}{1} \times \frac{9}{400} \times \frac{24}{360} = \text{?}$$

Use cancellation as a short cut to find the interest on the following.

23. \$320 at $3\frac{3}{4}\%$ for 72 days.

24. \$750 at $4\frac{1}{2}\%$ for 8 mo.

25. \$80 at $6\frac{1}{4}\%$ for 36 days.

26. \$90 at $7\frac{1}{2}\%$ for $1\frac{1}{3}$ yr.

27. Find the interest on \$2677.50 at $4\frac{1}{2}\%$ for 1 year. When the interest you figure is not a whole number of cents, what is done?

$$\begin{array}{r} \$2677.50 \\ .04\frac{1}{2} \\ \hline 133875 \\ 1071000 \\ \hline \$120.4875, \text{ or } \$\text{?} \end{array}$$

Find the interest on —

28. \$1693.25 at $2\frac{1}{4}\%$ for 1 yr.

29. \$756.34 at 4% for 8 mo.

30. \$3150.50 at $3\frac{1}{2}\%$ for 1 yr.

31. A savings bank pays interest at the rate of 2% a year. What is the interest on \$318 for 6 months.

32. A savings and loan association pays interest at the rate of 3% a year. What is the interest on \$475 for 6 months?

33. Another savings and loan association pays interest at the rate of $3\frac{1}{2}\%$ a year. Find the interest on \$648 for 6 months.

Installment Buying

Very often a person needs new clothes, an automobile, tools, or other goods, but does not have money enough to pay for what he wants. Merchants will often allow such a customer to buy the goods and pay for them later. Payment is made in small weekly or monthly amounts, called *installments*. Buying in this way is called *installment buying* or *buying on time*.

When a merchant sells on the installment plan, he has extra expenses in keeping books and collecting accounts. There also may be losses. Therefore, the installment price of goods is usually more than the cash price. This extra cost is called the *carrying charge*.

1. Bill wanted to buy the bicycle in the picture above. How much higher was the installment price than the cash price? What per cent was the carrying charge of the cash price?

2. Mr. Mills bought a tire on time. The cash price was $15. The installment price was $1.50 cash and $3 a month for 5 months. What carrying charge did Mr. Mills have to pay? What per cent was the carrying charge of the cash price?

3. The cash price of a sedan was $1944. The installment plan was $33\frac{1}{3}\%$ cash and $114.40 a month for 12 months. How much was the carrying charge?

4. Mrs. Green selected a refrigerator costing $250 cash. The installment price was $35 down and $20 a month for 12 months. How much was the carrying charge? What per cent was the carrying charge of the cash price?

5. Mr. Ames wanted to buy a car costing $2220. He had $1500 which he planned to use as a down payment. The dealer offered to sell the car for $1500 down and 12 monthly installments of $66 each. Mr. Ames found that he could borrow $720 from the bank at $6\frac{1}{2}\%$ interest per year. How much would Mr. Ames pay for the car under each plan? Which would cost less?

Installment Loans

1. John borrowed $25 from his father so that he could buy a paper route. He agreed to pay 3% interest and pay the money back at the end of one year. How much interest did John pay?

2. Do you think that a bank or a loan company would have loaned John $25 at 3% interest? Why would it not pay for a bank or a loan company to lend such small amounts at so low a rate of interest?

3. A loan company advertised loans at $2\frac{1}{2}\%$ interest per *month*. If Mr. Hill borrowed $300 for a month, how much interest would he have to pay? Why was the rate of interest so high?

4. Mrs. Jones was seriously ill for several months. Medical and hospital bills were more than Mr. Jones could pay. He borrowed $200 from a finance company at $2\frac{1}{2}\%$ interest per month. He agreed to repay the money in 10 equal monthly payments, plus interest. Complete the figuring at the bottom of the page to find how much interest in all Mr. Jones had to pay.

5. Mr. Smith borrowed $150 from a loan company. He agreed to repay the principal in 6 equal monthly payments. He agreed to pay interest at $2\frac{1}{2}\%$ per month.

Make a table as in example 4 to show how much in principal and how much in interest he had to pay each month.

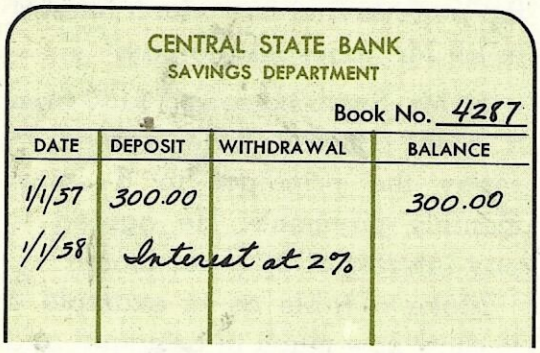
6. Miss Dale borrowed $150 from an industrial bank. The interest was 10% per year, and it was deducted from the amount she received. Miss Dale agreed to repay the loan in 12 equal monthly payments.

How much money in all did Miss Dale have to pay to the bank? How much had she received from the bank? How much did Miss Dale pay to the bank each month?

7. Miss Lee borrowed $120 from a loan company. She repaid principal and interest in 6 equal payments of $21.75. What was the total interest?

DATE	PAYMENT NUMBER	BALANCE DUE	AMOUNT OF PAYMENT	INTEREST
Jan. 15	1	$200	$20	$5 ($2\frac{1}{2}\%$ of $200)
Feb. 15	2	$180	$20	$? ($2\frac{1}{2}\%$ of $180)
Mar. 15	3	$?	$?	$?

Business Problems



CENTRAL STATE BANK
SAVINGS DEPARTMENT

Book No. 4287

DATE	DEPOSIT	WITHDRAWAL	BALANCE
1/1/57	300.00		300.00
1/1/58	Interest at 2%		

1. The picture above shows Mrs. Brown's bank deposit book. How much interest did she receive? What should be the new balance?

2. Mrs. Black has $400 in a savings and loan association. The interest rate is 3% a year. How much interest will Mrs. Black receive for a 6-month period?

3. Tom had $15. He spent $3 for a bicycle light. What per cent of his money did he spend?

4. Bill had 40 papers to sell. He sold 35 of them. What per cent of his papers had he sold?

5. A grocer marks cookies so that 20% of the selling price is profit. Cookies cost the grocer 24¢ a dozen. What should be the selling price per dozen?

THINK: 80% of selling price is the cost.

6. Last year Jack got $.80 interest on his bank account. The interest rate was 2%. How much money did Jack have in his account?

THINK: 2% of account = $.80
100% of account = ?

7. Billy sold his bicycle for $16. This was 50% of what he had paid for it. How much had he paid for it?

8. Mr. Smith paid $14,000 for a home. He sold it for 15% more than he paid for it. What was the selling price?

9. A new corporation had 2000 shares of stock for sale. Within one day, 800 shares were sold. What per cent of the shares were sold the first day?

10. Mrs. Cooper saved $18 a month. This was 6% of her husband's wages. How much were her husband's wages?

11. The cash price of a living room set is $500. The installment price is $540. The carrying charge is what per cent of the cash price?

12. The cash price of a radio is $22.50. The installment price is $7 down and $2 a week for 10 weeks. The carrying charge is what per cent of the cash price?

13. The cash price of a radio is

$22.50. The installment price is $27. The installment price is what per cent of the cash price?

THINK: $\frac{\$27.00}{\$22.50} = 1.2 = \square\%$

14. A new bicycle costs $45. A used bicycle costs $25. The cost of the new one is $\square$ % as much as the cost of the used one.

15. The population of Alton was 750. Ten years later the population had increased $33\frac{1}{3}\%$. How much was the increase? What was the total population at the later date?

16. John was earning $72 a week. His pay was reduced $12\frac{1}{2}\%$. By how much was his pay reduced? What did he earn per week after the reduction?

17. Betty earns $40 a week. Sue earns 125% as much. How much does Sue earn?

18. Al's salary is $500 a month. This is 125% as much as his salary last year. What was his salary last year?

19. Mabel's father sold their home for $15,000. The real estate agent charged 5% commission. How much was the commission?

20. A real estate company charges 5% commission for selling property. Last month their total commissions amounted to $1760. What was the total selling price of the property the company sold?

21. Last year Mike earned 50¢ an hour working in a garden. This year he earns 65¢ an hour. How much more per hour does he earn this year? The increase is what per cent of the amount he earned last year?

22. Last week butter was 75¢ a pound. This week it is 66¢. The decrease is how much per pound? The decrease is what per cent of last week's price?

23. The regular price of a table is $65. The sale price is 20% less. How much is the sale price?

24. The list price of a lamp is $45. There are discounts of 20% and $16\frac{2}{3}\%$. What is the net price?

25. The Greer family's income is $480 a month. They use $144 a month for food, $120 for home, $60 for clothes, and save $48. What per cent of the monthly income do the Greer's use for food? For home? For clothes? What per cent do they save?

26. The value of a new car decreases about 40% the first year. A new car cost $2750. What is it worth at the end of one year?

How Well Have You Learned?

1. A factory worker is paid 16¢ per dozen heels nailed on. Mr. Hale nailed on these amounts in one week: Mon., 105 doz.; Tue., 111 doz.; Wed., $104\frac{1}{2}$ doz.; Thu., $112\frac{1}{4}$ doz.; Fri., 108 doz. What did Mr. Hale earn for the week?

2. Miss Blue is paid $\$1.37\frac{1}{2}$ per hour. She works from 8:30 A.M. till 5 P.M., with a half hour off for lunch. How much does she earn per day?

3. The wages are $1.60 an hour with "time and a half" for overtime. Overtime is time of more than 8 hr. per day. Mr. Ellis worked 9 hr. on Monday, 8 hr. on Tuesday, 7 hr. on Wednesday, 10 hr. on Thursday, and $9\frac{1}{2}$ hr. on Friday. How much did he earn on Thursday? For the whole week?

Find the interest on —

4. $750 at 4% for 2 yr.

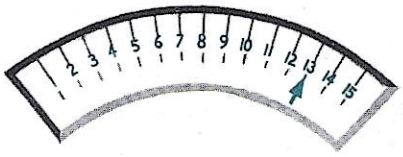
5. $320 at $6\frac{1}{4}\%$ for 3 mo.

6. $900 at $4\frac{1}{2}\%$ for 36 days

7. $400 at 4% for 15 mo.

8. $740 at $5\frac{1}{2}\%$ for 9 mo.

9. Last year Tom received $6 interest on his bank account. The interest rate was $2\frac{1}{2}\%$. How much money did Tom have in his account?



10. Mr. Edwards repaid a $200 loan in 12 equal monthly payments of $20 each. What rate of interest did he pay?

11. A case (24 cans) of pears costs $6.72. One can costs 32¢. What per cent less is the case rate than the 1-can rate?

12. A furniture dealer paid $45 for a table. Transportation cost was $6.35. Overhead was $8.50. The dealer sold the table for $99.75. What was the total cost? The margin? The net profit?

13. Lou keeps account of the goods sold in her confectionery. Find the total amount.

17 pt. of ice cream at 40¢ each
12 qt. of ice cream at 75¢ each
83 bottles of soda at 8¢ each
13 cases of soda at 92¢ each

Find the carrying charge, and what per cent the carrying charge is of the cash price.

14. The cash price was $200. The credit price was $25 down and $20 a month for 10 months.

15. The cash price was $37.50. The credit price was $5 down and $5 a month for 8 mo.

Help Yourself to Improve

Wage Rates:
15¢ per dozen heels nailed on
$7\frac{3}{4}$¢ per dozen buckles sewed
27¢ per dozen shoes cut out
Minimum Wage: $1 per hour

1. Mr. Drake nailed on 396 doz. heels in a week. How much did he earn that week? (221)

2. The first week (40 hr.) that Mr. Drake worked he nailed on 240 doz. heels. How much did he earn that week? Explain. (221)

3. Mrs. Ellis sewed on 128 doz. buckles in one day (8 hr.). How much did she earn that day? (221)

4. Henry Coke cut out only 24 doz. shoes the first day (8 hr.) that he worked. How much did he earn that day? (221)

5. Dick Jones works regularly from 8:15 A.M. till 4:45 P.M., with a half hour off for lunch. At $\$1.22\frac{1}{2}$ an hour, what is his daily pay? (222)

6. Motor oil is 35¢ a quart or $1.20 a gallon. How much is saved when you buy motor oil by the gallon? What per cent is this of the lower price? (224)

7. Jane paid $3.75 for a bracelet. This is 25% less than the regular price. What was the regular price? (225)

8. A jeweler paid $112.50 for a ring. Overhead was $45. He sold the ring for $225. What was the margin? The net profit? What per cent was the net profit of the selling price? (230)

9. A dealer sold a refrigerator for $205. The gross profit was $41. What per cent was the gross profit of the selling price? (230)

10. The electric company allows a discount of 5% on bills paid within ten days. Mrs. Adams paid the bill within ten days and saved 32¢. What was the total amount of the bill? (229)

11. The list price of a stove is $240. There are discounts of $16\frac{2}{3}$% and 15%. What is the net price? (231)

Find the interest on — (236)

12. $360 at 5% for $1\frac{1}{2}$ yr.

13. $150 at 8% for 4 mo.

14. $480 at $6\frac{1}{4}$% for 60 da.

15. Miss King borrowed $150 from a loan company. She repaid principal and interest in 12 equal payments of $15.50. What was the total interest? (239)

Show That You Know

1. Mrs. Huff sews pockets on overalls. The rate is 21¢ per dozen pockets. She sewed these amounts in one week: Monday, 42 doz.; Tuesday, 53 doz.; Wednesday, $52\frac{1}{3}$ doz.; Thursday, $51\frac{2}{3}$ doz.; Friday, 46 doz. How much did Mrs. Huff earn on Thursday? For the whole week?

2. Ralph works from 1 P.M. till 10 P.M. with an hour off for dinner. He earns $\$1.87\frac{1}{2}$ an hour. How much does he earn per day?

Find the total wages.

3. 36 hr. @ $\$3.12\frac{1}{2}$ an hour.

4. $38\frac{1}{2}$ hr. @ $2.72 an hour.

Find the interest on —

5. $620 @ 5% for 120 da.

6. $360 @ $4\frac{1}{2}$% for 9 mo.

7. $450 @ 4% for $1\frac{1}{3}$ yr.

8. Find the total amount received from these sales of coffee.

47 lb. @ $1.09 a pound.
64 lb. @ 89¢ a pound.
93 lb. @ 79¢ a pound.
76 lb. @ 91¢ a pound.
52 lb. @ 83¢ a pound.

9. The cash price of a radio was $49.95. The credit price was $9.95 down and $4 a week for 12 weeks. How much was the carrying charge?

10. The cash price of a sofa was $250. The credit price was $280. What per cent is the carrying charge of the cash price?

11. The list price of a rug was $120. There were discounts of 25% and 10%. What was the net price?

12. A hardware dealer paid $152.50 for a power saw. Transportation from factory to store was $7.50. Overhead was $15. The dealer sold the saw for $200. What was the margin? What was the net profit? The net profit was what per cent of the selling price?

13. Roger paid $105 down on a used car. This was 15% of the total cost. What was the total cost?

14. Profit on candy is 25% of the selling price. What should be the selling price of candy that cost 60¢ a pound?

15. Miss Hart borrowed $250 from a loan company. The loan was to be repaid in 15 equal monthly payments of $19.20. What was the total interest paid? What rate of interest did Miss Hart pay? (Nearest whole per cent)

16. Karen had $6. She spent 75¢ for a movie. What per cent of her money did she spend for the movie?

	Receipts				Expenditures		
May 1	Cash on hand	$ 14	94	May 3	School lunches	$ 3	00
3	Allowance	5	00	3	Movie		50
7	Sale of bicycle	15	00	8	Bicycle	25	00
12	Mowing grass		50	10	Bicycle light	1	60
18	Delivering groceries		75	12	Movie		50
25	Contest prize	10	00	15	Soda		25
				20	Ball game		75
				28	Swim		50
				29	Put in savings account	10	00
						$ 42	10
					Balance	4	09
		$ 46	19			$ 46	19
June 1	Cash on hand	$ 4	09				

Personal Accounts

The drawing above is a copy of two pages from Albert's account book.

1. How much money did Albert have on May 1? On June 1?

2. Where did Albert enter (make a record of) the money he received? Of the money he spent?

3. How did Albert find the balance? Why did he enter the balance as "cash on hand" for June 1?

Make a form like the pages from Albert's account book for each of the following examples. Make the needed entries to show each of the accounts.

4. Balance as of January 1:

Cash on hand: Dec. 1, $1.68.

Receipts: Dec. 1, scrap iron, $3; Dec. 8, paper route, $3; Dec. 12, distribute handbills, 50¢; Dec. 15, paper route, $3; Dec. 22, paper route, $3; Dec. 25, present, $2; Dec. 29, paper route, $3.

Expenditures: Dec. 10, bicycle tire, $2; notebook, 10¢; Dec. 15, Christmas cards, 30¢; Dec. 16, stamps, 10¢; Dec. 20, gift, $3; savings account, $2.50.

5. Balance as of September 1:

Cash on hand: Aug. 1, $79.60.

Receipts: Aug. 1, salary, $50; Aug. 15, salary, $50.

Expenditures: Aug. 1, electricity, $3.04; gas, $2.15; telephone, $3; water, $1.25; Aug. 15, clothes, $18.40; Aug. 16, car repair, $6.80.

6. Balance as of February 1:

Cash on hand: Jan. 1, $.78.

Receipts: Jan. 2, washing windows, $1.50; Jan. 5, ironing, 75¢.

Expenditures: Jan. 3, club entertainment, $.35; bus fare, 20¢; Jan. 17, movie, $.50; Jan. 25, birthday gift for sister, $.50.

Family Budgets

Terry saw a baseball glove at a sale. He checked his money and found that he had a total of $8.25. That evening he hurried to the store and bought the glove.

The next day Terry remembered that a payment was due on his bicycle, and he had to borrow money from his father to pay it. He had nothing left for his savings account. Later in the week, he had to skip the hayride to which he'd been looking forward.

1. Why was it foolish for Terry to buy the glove "on the spur of the moment," even though he used his own money? How would a personal account have been helpful for him?

2. In planning the use of his money, why should Terry have asked himself these questions?

- How much do I earn?
- Do I have any other income?
- What are my fixed expenses?
- How much do I save?
- What is left to spend?

Money is usually spent wisely when it is spent according to a plan. Such a plan for spending money is called a budget.

3. Would Terry's expenses be the same every week throughout the year? Would a family have exactly the same expenses every week or every month? Explain why most family budgets are planned for a whole year.

All the following problems concern the budget of the Wall family. Save your answers to each problem. Most of them will be needed in later problems.

4. Mr. Wall earns $80.00 per week. Each week these amounts are deducted from his pay: income tax, $3.00; social security, $1.60; hospital insurance, $1.50; pension, $2.00. How much is deducted each week? How much is Mr. Wall's "take-home" pay per week? Per year (52 wk.)?

5. The Walls have four $1000 bonds that pay $2\frac{3}{4}\%$ interest. Mr. Wall earns $100 extra each year during the Christmas holidays. What do these extra earnings amount to per year?

6. Find the total income that the

Wall family has to use each year.

7. The following list gives the fixed expenses which the Walls must pay during a year. These fixed expenses must be paid when they are due and cannot be reduced much by economizing. Find the sum of these fixed expenses.

- House payment, $47.50 per mo.
- Coal, 9 T. per yr. @ $13.50.
- Electricity, $3.85 per mo.
- Gas, $3.40 per mo.
- Telephone, $4.25 per mo.
- Contributions, $62.50 per yr.
- Life insurance, $38 every 3 mo.
- Property taxes, $134; $12.30 per yr.
- Bus fare to work, $2 per wk.

8. How much of the Wall family's income was left after all fixed expenses had been deducted? What is left must pay for day-to-day living and for emergency expenses which cannot be planned for exactly in advance. Medical bills, home repairs, and the like come under emergency expenses. About how much of the money should be used for day-to-day expenses? For emergencies?

9. Mr. Wall figured that 90% of the family income after deductions and fixed expenses would be needed for day-to-day living expenses. How much would this amount to per year? Per week?

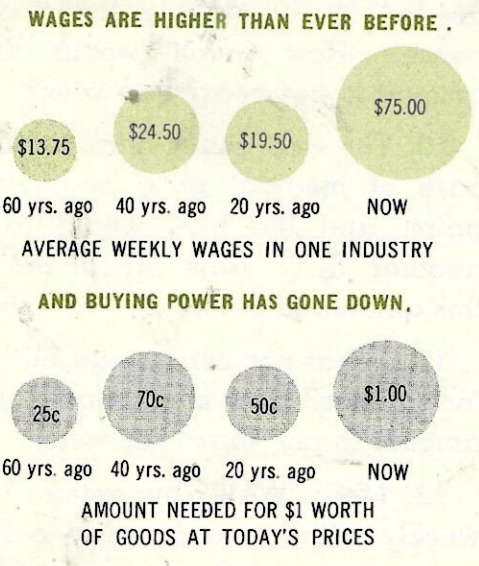
10. The emergency fund, to take care of medical bills, house repairs, and the like, would take another $5\frac{1}{2}\%$. How much would this amount to per year? Per week?

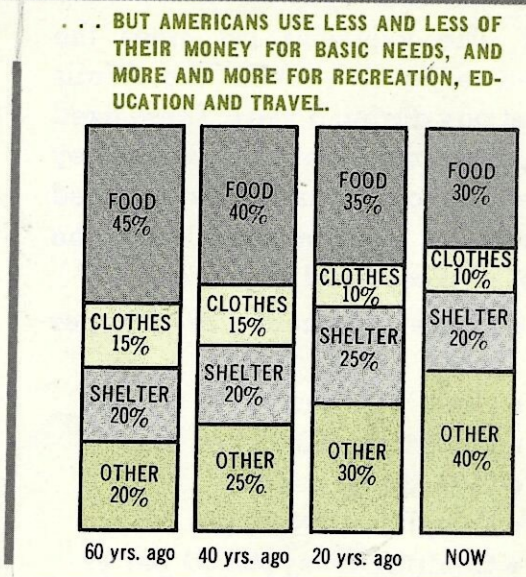
11. What per cent would be left for savings? How much would this amount to per year? Per week?

12. Mrs. Wall budgeted the weekly allowance for day-to-day expenses as follows: food, $30; household needs, $4; clothing, $6; miscellaneous, $5.90. Miscellaneous expenses included allowances for the Wall children, Ted, Bill, and Sue; personal needs of Mr. and Mrs. Wall; and recreation. How much was allowed per year for each item?

13. The Wall family had allowed $6 per week for clothing. They decided that the parents should divide evenly between themselves one half of the clothing allowance, and that the three children should divide the other half equally. Make a circle graph to show how the clothing allowance was divided among the five members of the Wall family.

IN AMERICA TODAY ★★★★★★★★★★★★★★★★





Consumer Spending

1. The display in the picture was shown at a county fair. Study and explain each part of the display.

2. People who use, or consume, goods are called *consumers*. The goods they use are called *consumer goods*. What are the main classes of consumer goods? What would be included in "Other" in the graph above?

3. Will the graphs on the right side of the display tell whether more dollars or fewer dollars are being spent for food today than in previous years? What other information must you have?

4. Copy and complete the table below. Use information in the display. Round each answer to the nearest whole cent.

TIME			60 yrs. ago	40 yrs. ago	20 yrs. ago	Now
WEEKLY INCOME			$13.75	$24.50	$19.50	$75.00
WEEKLY EXPENDITURES FOR—	FOOD	Per Cent	45%	40%	35%	
		Amount	$6.19	$9.80		
	CLOTHING	Per Cent	15%	15%		
		Amount	$2.06			
	SHELTER	Per Cent				
		Amount				
	OTHER	Per Cent				
		Amount				

5. Twenty years ago the people of the United States spent about $56,289,000,000 for all consumer goods. How many dollars were spent for food? For clothing? For shelter? For other goods and services?

6. About 1% of what Americans spend today is used to pay for travel in foreign countries. In 1940, they spent only .31%. Try to find what kept people at home in 1940. Find how much was spent on foreign travel in 1940, when the total amount spent for all goods and services was about $71,881,000,000.

The number of dollars spent does not always give a fair idea of the amount of goods bought. One part of the county fair display on the opposite page shows that goods which cost $1 now could be bought for less money in the past.

7. Goods costing $1 today could be bought for what amount 60 years ago? Sixty years ago $1 would buy the same amount of goods as $[redacted] will buy today.

THINK: $.25 bought $1 worth; 4×$.25, or $1, bought $[redacted] worth.

8. Refer to the table in problem 4. Today's worker buys $[redacted] worth of food a week. The worker of 60 years ago paid $[redacted] a week for his food. Each dollar spent 60 years ago bought [redacted] times as much as a dollar will buy now. So, figuring on the basis of today's values, the worker of sixty years ago bought $[redacted] worth of food.

9. A certain family uses an average of 12 bushels of potatoes a year. Sixty years ago potatoes cost 30¢ a bushel. Now they cost $1.20 a bushel. What would a year's supply of potatoes have cost 60 years ago? What would this cost now?

10. A worker's family uses 75 quarts of milk a month. What would the family's milk bill have been 60 years ago, when milk cost 5¢ a quart? The price of milk now is 400% of what it was 60 years ago. What would the worker's monthly milk bill be now?

Prove these statements.

11. Wages of $19.50 a week 20 years ago would buy as much as wages of $39 a week now.

12. Mr. Jones earned $28 a week 40 years ago. This would buy as much 40 years ago as $40 will buy today.

13. Today goods cost twice as much as they did 20 years ago, and four times as much as they did 60 years ago.

Budget Problems

A good housewife spends her food money wisely so that she can provide her family with a balanced diet. One expert suggests that the food money be spent like this:

- Meat, fish, or fowl 25%
- Dairy products 20%
- Canned goods, and staples 20%
- Fruits and vegetables 20%
- Fats and sugars 15%

1. Make a graph to show what the expert suggests.

2. Mrs. Dunn has $36 a week to spend for food. How many dollars should she spend for each item given in the expert's table?

3. Mrs. Dunn allows $9 a week for meat, fish, or fowl. She has bought 5 lb. of beef roast at 65¢ a pound, half a ham (6 lb.) at 55¢ a pound, and 2 chickens at $1.15 each. How much has she spent? Does she have enough left to buy a pound of bacon at 65¢ a pound?

4. Mrs. Dunn allows $7.20 for dairy products. She has bought 16 qt. of milk at $22\frac{1}{2}$¢ a quart and 2 lb. of butter at 70¢ a pound. How much has she spent? What per cent of her $7.20 has she used?

5. Mrs. Dunn's budget calls for $7.20 for canned goods and staples. One day she bought flour, orange juice, canned peaches, baking powder, and salt. Her total bill was $2.88. What per cent of her budget for canned goods and staples does she have left?

6. Mrs. Miles spent $142.87, $139.28, and $159.60 for food for three months. What was the average monthly expenditure? At this rate, how much would she spend for food in a year?

7. Mrs. Horton allows $8.00 per week for canned goods and staples. One week she saw canned peas advertised for 20¢ a can or $4.20 for a case of 24 cans. The case would last about 10 weeks. How much would she save by buying the case? How much would this amount to per week? Would it be wise for her to buy the case?

8. Mrs. Lunt spent $8.29 for meat and fish, $5.17 for dairy products, $6.07 for canned goods and staples, $5.33 for fruits and vegetables, and $4.14 for fats and sugars. How much did she spend in all? What per cent did she spend for each type of food? Explain why these per cents are not exactly the same as those in the expert's table.

No Pencils, Please

Many problems in everyday life are simple enough to be solved without writing figures on paper. This page is intended to give practice in solving this kind of problem. Write answers only.

Bill's income is $2000 a year. Use the per cents in the graph to find how much he has for —

1. Shelter
2. Food
3. Clothes
4. Medical
5. Taxes
6. Other

BILL'S BUDGET

The cost of shelter averages about 25% of a family's total expenditures. Find the total expenditures when cost of shelter is —

7. $600 8. $750 9. $625
10. $720 11. $900 12. $1000

The Bascom family income is $100 a week. Study the graph to find what per cent is spent for —

13. Shelter 14. Food
15. Clothes 16. Other

SHELTER	CLOTHING	FOOD	OTHER
$25	$15	$32	$28

Find what a dozen apples will cost when they are —

17. 3 for 25¢ 18. 4 for 35¢
19. 2 for 15¢ 20. 6 for 49¢

Find how many plums you can buy for $1 when they are —

21. 3 for 10¢ 22. 7 for 20¢
23. 9 for 25¢ 24. 18 for 50¢

Peaches are 2 for 15¢. Find the cost of —

25. 6 peaches 26. 10 peaches
27. 8 peaches 28. 18 peaches

Apples are 3 for 25¢. Find the cost of —

29. 6 apples 30. 12 apples
31. 15 apples 32. 18 apples

Find how many 2-cent stamps you can buy for —

33. 40¢ 34. $1 35. $1.20

The rate of a sales tax is 2%. Find the sales tax on a sale of —

36. $5 37. $3.50 38. $25

A store offers a 20% discount. Find the discount on goods that are marked —

39. $40 40. $75 41. $4.50

A salesman receives a commission of 8%. Find his commission on sales of —

42. $100 43. $500 44. $250
45. $50.50 46. $2000 47. $810

Budgeting for Shelter

Mr. and Mrs. Miller live in an apartment a few blocks from where Mr. Miller works. They plan to buy a home in an outlying section of the city. Before buying the home, the Millers want to compare the average monthly costs of providing shelter in the two locations. Their comparison is shown below.

	Apartment	New Home
Rent	$105.00	$60.00 (mortgage payment)
Property taxes	none	20.00
Insurance	none	5.50
Maintenance & repairs	none	10.00
Heat	included in rent	20.00
Electricity	5.00	5.00
Telephone	5.50	5.50
Gas for cooking	2.00	2.00
Gas for hot water	included in rent	1.50
Water	included in rent	1.50
Furniture	15.00	15.00
Household needs (soap, utensils, linens, etc.)	10.00	10.00
Garage rent	4.50	none
Transportation to work	none	8.00

1. Explain why each of the items is included as part of "shelter." Why has Mr. Miller included transportation to work?

2. What is the total monthly cost for shelter in the apartment? What will it be in the new home?

3. Why do you think the Millers are willing to pay more for shelter in a home of their own? Which items did the Millers not have to pay for in the apartment? Who paid for these items? Why was it actually the Millers who paid?

4. Part of the apartment rent gave the owner payment for his work in taking care of the building. It also paid him a certain amount for interest on the money he had invested in buying the property. What will the Millers get for the money they will pay on their mortgage?

▶ Most experts agree that a family should use about 25% of its income for all shelter expenses. However, rent should not be more than 20% of the total income.

5. Mr. Miller earns $600 per month. What per cent of his salary is used for shelter in the apartment? What per cent of his salary will go for shelter in the new home? How do these figures compare with recommendations of the experts?

6. What per cent of Mr. Miller's $600 earnings does he pay for rent of the apartment? Compare this with recommendations.

7. The income of the Jackson family is $5200 a year. According to the experts, approximately how much should they spend for shelter? What is the most they should pay for rent?

▶ According to one expert, a family cannot afford to buy a home that costs more than twice its yearly income.

8. The new home the Millers intend to buy costs $14,000. Can they stay within the recommended limits on Mr. Miller's $600 per month?

9. The Nelson family income is $4250 a year. According to the expert, what is the highest price they can afford for a home?

10. Insulation of walls and ceilings can make a saving of 30% of the cost of heating. How much can insulation save for a family whose annual fuel bill is $200?

11. Mr. and Mrs. Gill have saved $7000. This money brings in interest at 3%. The Gills used their $7000 and borrowed $5000 more to buy a $12,000 home. They will pay $38.25 a month for 15 years to pay off the $5000 mortgage on their home. It will cost them an average of $360 a year to pay taxes, insurance, and repair bills on the home. How much per year is it costing them to own the home? (Sum of interest they are losing, monthly payments, and $360 a year.) How much is this per month? Is it cheaper to pay rent at $75 a month, or to own the home? Discuss the advantages and disadvantages of each.

Budgeting for Food

1. The Woods have a yearly income of $2730. They budget 30% of this for food. How many dollars do they budget for food per year? Per month? Per week? Per day?

2. There are three persons in the Wood family. Each person has three meals a day at home. When the total cost for food is $2.25 a day, what is the average cost per meal per person?

3. The usual price of pork and beans is 2 cans for 25¢. At monthly sales, the price is 10 cans for $1. How much can Mrs. Wood save in buying 10 cans at the lower price? The saving is what per cent of the regular price?

4. Choice pears are 40¢ a can. At a canned goods sale, Mrs. Wood can buy a case of 24 cans for $8.40. How much can she save if she buys two cases? The saving is what per cent of the regular price?

5. One brand of tomatoes costs 45¢ for two cans. An equally good brand is 15¢ a can. The cans are the same size. What is the cost of a dozen cans of the first brand? Of a dozen cans of the second brand? Mrs. Wood uses about five dozen cans in a year. How much can she save if she buys the second brand?

6. The Woods use about a pound of butter or margarine a week. The butter is 78¢ a pound. The margarine is 24¢ a pound. How much could they save in a year by using margarine?

7. One brand of salmon is 50¢ a can. Another brand, equally good, is 45¢ a can. The Woods use about 24 cans of salmon a year. How much can they save if they buy the less expensive brand?

8. Mrs. Wood's actual expenditures for food in June, July, August, and September were $72.25; $77.60; $78.45; and $81.70. What was the average expenditure for this period of four months? How much more did Mrs. Wood spend than her budget allowed?

9. Mrs. Wood spent $37 more than her budget allowed during the summer and fall to buy fruit and vegetables for canning. The fruit and vegetables she canned saved an average of $12.50 a month for five winter and spring months. How much did the savings exceed the cost of the fruit and vegetables canned?

10. A family-size can of apricots contains 1 lb. 4 oz. and costs 35¢. A restaurant-size can contains 6 lb.

10 oz. of the same grade apricots. The larger can costs $1.59.

There are ? oz. of apricots in the smaller can. The cost is ? cents per ounce.

There are ? oz. in the larger can. The cost is ? cents per ounce.

The smaller can will make three servings. The larger can will make sixteen servings. To the nearest whole cent, find the cost of a serving from the smaller can. From the larger can.

11. A bushel of potatoes weighs 60 lb. A vegetable dealer offers the same grade of potatoes for $1.75 per 100-pound bag, or $1.20 a bushel, or 35¢ a peck. What is the cost per pound when you buy potatoes by the bag? By the bushel? By the peck?

12. Mrs. Wood bought a 100-pound bag of potatoes for $1.75. About one fourth of them spoiled. How many pounds did she actually get for $1.75? What, then, was the cost per pound of the potatoes she used? How much was this per peck?

13. Fresh bread is 20¢ a loaf. Day-old bread is 10¢ a loaf. A family uses a loaf of bread a day as toast. How much can be saved per year if day-old bread is used?

14. Mrs. Wood's account of food bought in March is given above. Explain each item. Find the balance at the end of March.

Have to spend

Balance from Feb.	$4.90
Allowed for March	68.25
Total	

What I spent

Date	Goods	Cost
1	Fruit	$1.45
2	Meat	7.25
3	Dry milk & oleo	1.09
6	Fruit	1.50
8	Groceries	5.82
	Chickens	5.25
9	Groceries	6.90
10	Meat	4.90
11	Groceries	6.80
15	Dry milk & oleo	1.09
16	Fruit	1.65
17	Meat	5.45
20	Groceries	8.72
27	Dry milk & oleo	2.18
30	Groceries	5.43
	Total for March	
Balance from March		

Budgeting for Clothing

1. The Stones have an annual income of $3640. They budget 15% of it for clothing. How much do they allow for clothing per year? Per month? Per week?

2. Mrs. Stone planned to wait for clearance sales for much of the clothing her family needed. She figured that she could buy about $300 worth of clothing at a discount of 30%. How much will Mrs. Stone have to pay for what she buys at clearance sales? How much will she save?

3. When stores are overstocked on certain items, they often have special sales. Mrs. Stone reasoned that at such sales she could buy about $250 worth of clothing at an average discount of 20%. According to her plan, how much will she have to pay for clothing bought at special sales? How much will she save?

4. Mrs. Stone figured like this: We have $546 to spend for clothing. If we buy $300 worth at 30% discount, it will cost $[illegible]. The $250 worth at 20% discount will cost $[illegible] .This means that we still have $[illegible] to spend for clothes.

5. The regular price of a suit was $78. Mr. Stone bought it at a sale for $59.50. What was the amount of the discount? The discount was what per cent of the regular price?

6. At a clearance sale, men's socks that are regularly $1 a pair are being sold at 4 pairs for $2.35. The saving is what per cent of the regular price?

7. A dress for a little girl is regularly priced at $2.97. It is on sale for $1.98. What is the per cent of the saving?

8. Mrs. Stone studied the advertisements of a big store. She found the following items that she needed to buy. Find the total cost at regular price, and at sale price. Find the per cent of saving, to the nearest tenth of a per cent, on the total purchase.

	REG. PR.	SALE PR.
Girls' skirts	$2.50	$1.85
Boys' shirts	$1.65	$1.10
Boys' slacks	$4.00	$2.88
Cord jacket	$5.00	$2.95
Ladies' shoes	$7.95	$5.30

9. Find the per cent of discount on each item listed in problem 8.

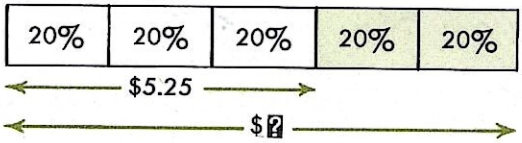
10. The regular price of men's dacron shorts was $2. At the August sale they were 4 pairs for $5. What was the saving in buying

4 pairs at the sale? The saving was what per cent of the regular price?

11. The regular price of men's T-shirts was \$1.25. The sale price was 2 shirts for \$1.75. How much could you save by getting 6 T-shirts at the sale? What was the per cent of the saving?

12. Sport shirts had been \$4.98 each. The sale price was \$2.49 each. What was the per cent of the saving?

13. The regular price of boys' dress jackets had been reduced 40%. The sale price was \$5.25. What had been the regular price?



14. The regular price of girls' school dresses had been reduced 40%. The sale price was \$2.70. What had been the regular price?

15. At an after Easter sale, the price of Easter dresses was reduced 60%. The sale price was \$6. What had been the regular price?

Mixed Practice

1.

43	67	938.3	3.87
9	285	22.8	6.4
79	320	400.2	5.29
67	99	6.9	29.1
43	283	25.0	.04
5	6	4.5	1.11
+21	+200	+389.3	+18.7

2.

$\frac{1}{2}$	$3\frac{1}{3}$	8.5	5.92
$\frac{3}{8}$	$3\frac{3}{4}$	.6	.40
$\frac{2}{3}$	$7\frac{1}{2}$	.9	3.72
$+\frac{5}{6}$	$+6\frac{1}{4}$	+1.3	+5.90

3.

4749	4300.91	479.0003
−2990	−3982.92	−298.7642

4.

$\frac{5}{8}$	$42\frac{3}{5}$	$753\frac{7}{16}$	$4\frac{15}{16}$
$-\frac{7}{16}$	$-29\frac{7}{8}$	$-592\frac{3}{4}$	$-4\frac{9}{10}$

5.

$8\frac{1}{3}$	$17\frac{1}{2}$	75.35	9.400
$-4\frac{1}{2}$	$-6\frac{2}{3}$	−1.67	−3.125

6.

58	203	4927	22.4
×29	×394	×200	×.875

7. $7\frac{2}{3} \times 9$ $\quad 8 \times 6\frac{5}{16}$ $\quad 2\frac{1}{2} \times 10\frac{11}{12}$

8. $429 \times 8\frac{2}{3}$ $\quad 4\frac{7}{8} \times 656$ $\quad 68\frac{1}{2} \times 5\frac{9}{10}$

9. $42\overline{)8364}$ $\quad 427\overline{)4468}$ $\quad 16\overline{)209}$

10. $6\overline{)27.36}$ $\quad 4.5\overline{)14.445}$ $\quad .87\overline{)313}$

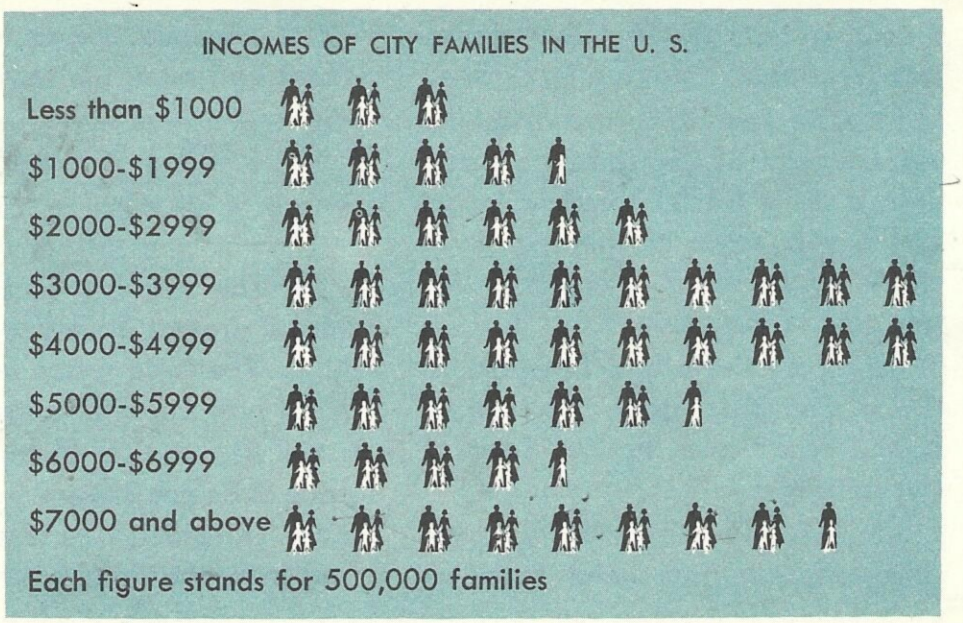
11. $\frac{4}{5} \div 17\frac{1}{2}$ $\quad 8 \div \frac{4}{7}$ $\quad 16\frac{2}{3} \div 4\frac{1}{6}$

12. 23 is ?% of 92 $\quad$ 48 is ?% of 288

13. 3% of 51 = ? $\quad 37\frac{1}{2}\%$ of 104 = ?

14. 10% of ? = 78 $\quad$ 43% of ? = 301

15. $\frac{7}{8}$ = ?% $\quad \frac{5}{6}$ = ?% $\quad \frac{2}{3}$ = ?%



Problem Solving

1. Study the graph above. The figures are for a recent year. How many families are there in each group? How many city families were there in all in the United States in that year?

2. Find to the nearest whole per cent what per cent of all families are in each group.

3. Make a bar graph to show the per cents you found in problem 2.

4. About 1.5% of the city families had incomes of more than $15,000. How many families was this?

▶ Social workers in a certain city figured that a family of four in that city should have an annual income of $4300 to live in a healthful way. These are the expenses of such a family.

Shelter	$1290	Medical	$215
Food	$1333	Taxes	$516
Clothing	$ 516	Other	$430

5. What per cent is each expense of the total?

6. Make a circle graph of the expenses shown in the table. How many degrees will there be in each part of the graph?

▶ The average budget for an unmarried woman working in a city

is about $2250 a year. These are her expenses.

Shelter	14%	Savings	6%
Food	32%	Taxes	12%
Clothing	12%	Other	24%

7. What is the annual amount in dollars of each expense?

8. Make a circle graph of the unmarried woman's expenses. How many degrees will there be in each part?

▶ The table below shows the yearly taxes of a family of four.

Federal income tax	$270.00
State income tax	33.75
Property tax	135.00
Unemployment tax	29.25
Social security tax	67.50
State sales tax	40.50
Excise tax (amusement, gasoline, etc.)	67.50
Automobile license	31.50

9. The social security tax was 2% of the father's wages for the year. What were his wages?

10. The total family income from all sources was $4050 a year. What per cent was the total tax of the total income?

11. What per cent of the total tax was each item of the tax?

▶ A family of four allowed $1500 a year for shelter. The yearly shelter expenses were divided as shown in the table below.

Rent of house	$600
Household needs	210
Furniture and furnishings	240
Transportation to work	450

12. What is the average per month of each item of shelter expense?

13. What per cent of the total is each item of shelter expense?

14. The allowance for shelter was $33\frac{1}{3}\%$ of the family's total budget. How much was their total budget?

▶ Below are listed the living expenses of a family in one large city.

Food	$1350	Medical	$300
Shelter	1500	Taxes	675
Clothing	400	Other	275

Complete the following statements about this family's budget.

15. They spent ▯% as much for food as for shelter.

16. They spent ▯% as much for taxes as for food.

17. They spent ▯% of their total budget for food.

18. They spent ▯% of their total budget for shelter.

19. They spent ▯% of their total budget for clothing.

Reading a Gas Meter

Fred went to the basement with the man who came to read the gas meter at his home. The man looked at the dials and wrote some numbers in his book. He explained to Fred that the meter measured the number of cubic feet of gas used.

1. The hand on the dial on the right side of the meter turns *clockwise*, that is, in the same direction as the hands of a clock. This dial measures *hundreds* of cubic feet. How many hundred cubic feet did this dial show on Fred's meter? How many cubic feet of gas are used each time this dial makes a complete revolution? Explain why 1000 appears above this dial.

2. The hand on the middle dial moves *counterclockwise*. What does this mean? It moves from one number to the next each time the right-hand dial makes one complete revolution. Explain, then, why this dial measures *thousands* of cubic feet. How many thousands of cubic feet did the middle dial on Fred's meter show? How many cubic feet of gas are used each time this dial makes one complete revolution? Why does 10,000 appear above this dial?

3. In which direction does the hand of the dial on the left side of the meter move? Explain why this dial measures *ten thousands* of cubic feet. How many ten thousands of cubic feet did the left-hand dial on Fred's meter show? How many cubic feet of gas are used each time this dial makes a complete revolution?

4. When the gas bill came, Fred noticed that the "present" meter reading was given as 184. Why is this what the dials showed? Explain why this stood for 184 *hundred* or 18,400 cu. ft.

5. Make up a rule for reading a meter.

City Gas Natural Gas

St. Louis 4, Mo.
UP. 1-3431

Bill to:
Mr. T. K. Hill
207 Dale Ave.

Date, May 10: Last day net, May 19.
Gross bill due after May 19.

City Gas
815 North 10th Street
St. Louis 4, Mo.
Please return with payment.

PREVIOUS READING	PRESENT READING	HUNDRED CU. FT.	SERVICE FROM	SERVICE TO	GROSS BILL DUE AFTER:	GROSS BILL	NET BILL
686	716	30	Mar. 4	April 4	MAY 19	$3.60	$3.42

Your Receipt	GROSS BILL	NET BILL	Payment from: Mr. T. K. Hill 207 Dale Ave.
	$3.60	$3.42	

Paying for Gas Service

1. Study the gas bill above. What was the meter reading on March 4? On April 4? How did the gas company find that Mr. Hill had used 30 hundred cubic feet of gas?

2. The price of gas was $1.20 per 1000 cu. ft. Explain why Mr. Hill's gross bill, or full bill, was $3.60.

THINK: 30 hundred = ☐ thousand

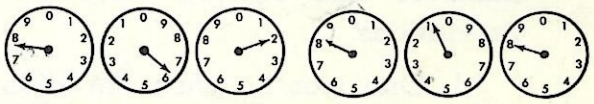
3. Within how many days must Mr. Hill pay if he wishes to pay the net bill, that is, the bill with the discount taken off?

4. How much less is Mr. Hill's net bill than his gross bill? This is the amount of the discount. What per cent of the gross bill is the discount?

5. The dials in the next column are as a meter reader saw them on April 1 and on May 1.

How many cubic feet of gas were used during April? At $1.20 per

APRIL 1 MAY 1



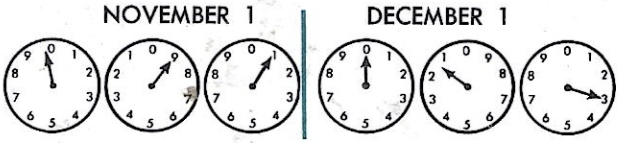
1000 cu. ft., what is the gross bill? At a discount of 5%, what is the net bill?

Find the amount of gas used, the gross bill, and the net bill for each of the following.

	PREVIOUS READING	PRESENT READING	COST PER 1000 CF	DISCOUNT
6.	322	369	$1.28	4%
7.	549	591	$1.25	5%
8.	603	627	$1.20	2%
9.	493	523	$1.12	$3\frac{1}{2}$%
10.	279	344	$1.16	4%
11.	786	806	$1.30	$4\frac{1}{2}$%

12. The dials on the next page show a meter on Nov. 1 and on

Dec. 1. How many cubic feet were used during November?



THINK: From the Nov. 1 reading to 000 = ▯ cu. ft. From 000 to the Dec. 1 reading = ▯ cu. ft.

13. Many gas companies use the abbreviation CCF to stand for "hundred cubic feet," and MCF to stand for "thousand cubic feet." Think of the letters used in Roman numbers and explain these abbreviations.

14. One month, when the Hills were away and had used no gas, they received a bill for 50¢. The gas company explained that the minimum charge is 50¢ per month. Explain.

Customers who use large quantities of gas often get reduced rates. The special rates of one gas company are shown below.

3 CCF or less	50¢ (minimum)
Next 7 CCF	15¢ per CCF
Next 20 CCF	12¢ per CCF
Next 70 CCF	9¢ per CCF
Over 100 CCF	7¢ per CCF

15. Use the rates to figure the gross bill of a restaurant which used 10,400 cu. ft.

THINK:

3 CCF	$ .50
7 CCF @ 15¢	1.05
20 CCF @ 12¢	2.40
70 CCF @ 9¢	6.30
4 CCF @ 7¢	.28
	$▯

Use the special rates to find the net bills on the following.

16. 3800 cu. ft. at 5% discount

17. 232 CCF at 2% discount

18. 11 MCF at 4% discount

19. 8.5 MCF at 5% discount

20. 125 CCF at $3\frac{1}{2}\%$ discount

21. 99 CCF at $1\frac{1}{2}\%$ discount

Mixed Practice

1.

8	42	986	750
7	8	47	7
4	73	143	917
0	86	8	84
9	19	79	92
3	70	840	773
+8	+5	+200	+93

2.

4862	9020	5000
−3184	−3916	−2004

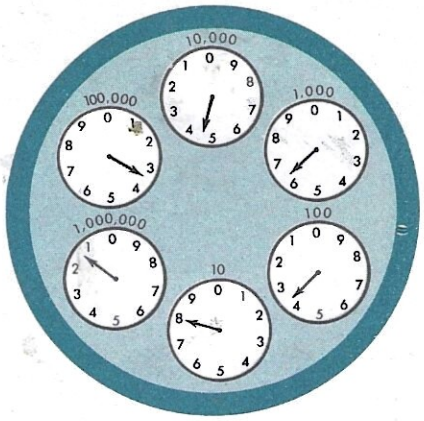
3. $8 \times 3\frac{3}{4}$ $\quad 8\frac{1}{3} \times \frac{4}{5}$

4. $866\frac{2}{3} \times 6$ $\quad 37\frac{1}{2} \times 240$

5. $12493 \div 89$ $\quad 63572 \div 92$

6. $1.728 \div .8$ $\quad 10.24 \div 1.6$

Paying for Water



Study the water meter above. Just as with a gas meter, each time the hand on a dial makes one complete revolution, the hand on the next dial moves from one number to the next.

1. How many cubic feet of water are used each time the hand on the dial marked "10" makes one revolution? For what does each number on this dial stand?

2. How many cubic feet of water are used each time the hand on each of the other dials makes one complete revolution?

3. On which dials do the hands move clockwise? Counterclockwise?

4. What is the reading of the meter above? Since water rates are figured by hundreds of cubic feet, the meter reader pays no attention to the first two dials. He reads only the total number of whole hundreds. He would read this meter as [2] cubic feet.

5. The previous reading of the meter above was 131,200 cu. ft. How many cubic feet had been used during the period?

In most localities the water meters are read every 3 months. The rates of one company are shown.

First 1200 cu. ft. $3.00 (minimum)
Next 4800 cu. ft. @ 20¢ per 100 cu. ft.
Over 6000 cu. ft. @ 15¢ per 100 cu. ft.

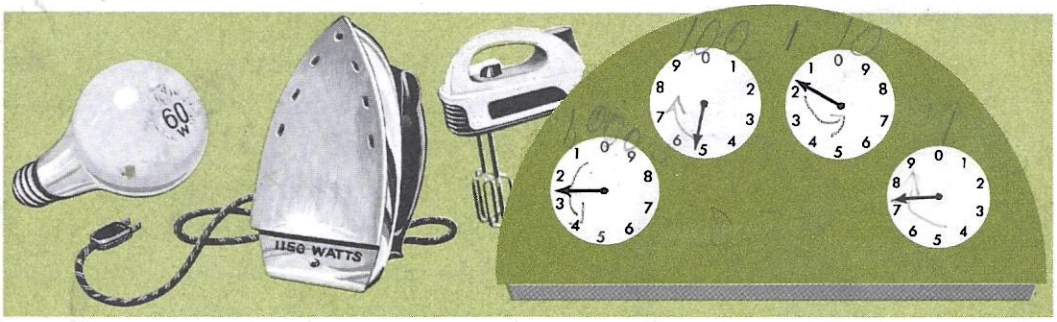
Use the rates above to figure water bills from these readings.

	PREVIOUS READING	PRESENT READING
6.	572,200 cu. ft.	581,100 cu. ft.
7.	873,900 cu. ft.	875,600 cu. ft.
8.	993,800 cu. ft.	500 cu. ft.
9.	682,500 cu. ft.	683,400 cu. ft.

10. Why do you think that water companies do not read meters every month?

11. A tiny stream of water flowing constantly may waste more than 75,000 gallons of water a month. At that rate, how much would the waste cost in a 3-month period? (Figure 15¢ per 100 cu. ft.)

THINK: 1 cu. ft. = $7\frac{1}{2}$ gal.



Electricity

Electricity is measured by a meter in much the same way as gas or water. Electricity, of course, cannot be measured in cubic feet. The unit of measure for measuring electricity is called the *watt*. Light bulbs and other appliances are marked to show the number of watts they use. A bulb marked "60 W" uses 60 watts.

Since the watt is a very small amount of electricity, another common unit of measure is the *kilowatt*, equal to 1000 watts. (*Kilo* comes from a Greek word meaning 1000.)

1. How many 50W bulbs would use a total of 1 kilowatt? 10 kilowatts?

2. Mrs. Grey has an electric coffee maker which uses 400 watts and a toaster which uses 600 watts. There are two 100W bulbs in the light fixtures in the kitchen. How many watts are used if the lights and both appliances are on at the same time? How many kilowatts?

An electric meter measures the number of *kilowatt-hours* (KWH) of electricity used. One thousand watts (one kilowatt) used for one hour is one kilowatt-hour. Thus, a 1000W appliance running for 1 hour uses 1 KWH of electricity.

Prove that each of the following will amount to 1 KWH.

3. Twenty 50W bulbs used for 1 hr.

4. Ten 50W bulbs used for 2 hr.

5. A 250W food mixer used for four hours.

6. A 750 W electric iron used for $1\frac{1}{3}$ hr.

7. One 40W bulb used 25 hr.

8. A 500W toaster used 2 hr.

9. A 1500W room cooler used 40 minutes.

10. A 2000W deep-fat fryer used a half hour.

■ **To find the number of kilowatt-hours used, multiply the number of kilowatts by the number of hours.**

Find the amount of electricity used by the following.

11. A 625W electric sweeper in 4 hours.

12. A 1250W ironer in 2 hours.

13. A $\frac{1}{3}$ HP motor (400W) in 5 hours.

▶ Study the meter on the opposite page. The dial on the right measures kilowatt-hours by 1's to 10 KWH. The next dial measures by 10's to 100 KWH, and so on.

14. Explain what each dial shows. The hands of which dials move clockwise? Counterclockwise?

15. How many KWH does the meter show? Why do we read the left-hand dial as 2 and not 3?

16. The previous reading of the meter in the picture was 2277. Find how many KWH were used during the month.

▶ The following are the rates of one electric company. Note that the rates are given in cents.

First	20 KWH or less $1.00
Next	20 KWH @ 3.45¢ per KWH
Next	160 KWH @ 2.45¢ per KWH
Next	200 KWH @ 1.90¢ per KWH
Over	400 KWH @ 1.75¢ per KWH

17. How much must a customer pay for 15 KWH? 19 KWH? Why does the company have a minimum charge?

18. Explain or prove each of the following statements.

$3.45¢ = \$.0345$
$2.45¢ = \$.0245$
$20 \times \$.0345 = \$.69$
$160 \times \$.0245 = \$3.92$

19. The Mills family used 240 KWH of electricity last month. Use the rates in the table to figure the cost.

Use the rates given in the table to figure electric bills from these meter readings.

	PREVIOUS READING	PRESENT READING
20.	4728 KWH	4908 KWH
21.	3902 KWH	4118 KWH
22.	9894 KWH	6 KWH
23.	1784 KWH	1802 KWH
24.	7040 KWH	7076 KWH
25.	2910 KWH	3174 KWH

26. One month Mr. Rice received a bill of $74.50. He checked it in order to find an error he thought had been made. The previous meter reading was given as 5032 and the present reading as 5329. The rates were the same as in the table on this page. What mistake had been made in the billing?

Mixed Review

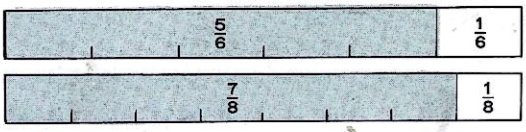
1. Which is larger, $\frac{7}{9}$ or $\frac{5}{9}$? $\frac{5}{8}$ or $\frac{3}{8}$? $\frac{13}{16}$ or $\frac{15}{16}$?

2. Make a rule for comparing fractions whose denominators are equal.

3. Which is larger, $\frac{1}{5}$ or $\frac{1}{6}$? $\frac{1}{4}$ or $\frac{1}{5}$? $\frac{1}{8}$ or $\frac{1}{7}$? $\frac{2}{8}$ or $\frac{2}{7}$?

4. Make a rule for comparing fractions whose numerators are equal.

5. Which is larger, $\frac{5}{6}$ or $\frac{7}{8}$?



THINK: $\frac{1}{6}$ is larger than $\frac{1}{8}$. Then, $\frac{5}{6}$ (equal to $1-\frac{1}{6}$) is less than $\frac{7}{8}$ (equal to $1-\frac{1}{8}$).

6. Which is larger, $\frac{4}{5}$ or $\frac{6}{7}$? $\frac{7}{8}$ or $\frac{8}{9}$? $\frac{5}{7}$ or $\frac{7}{9}$? $\frac{4}{7}$ or $\frac{5}{8}$? If necessary, make drawings to help you find the answers.

7. Change to per cents.

$\frac{3}{5}$ $\frac{7}{8}$ $\frac{17}{20}$ $\frac{5}{6}$ $\frac{1}{3}$

8. Change to common fractions in lowest terms.

$66\frac{2}{3}\%$ $87\frac{1}{2}\%$ 80% $37\frac{1}{2}\%$ $6\frac{1}{4}\%$

9. Change to decimals.

900% 90% 9% .9% .09%

10. Change to common fractions in lowest terms.

.45 $.33\frac{1}{3}$ .03 .25 .006

Find the answers.

11. $2.9+7.3+18.6+200.4$
12. $15.01+4.09+0.05+290.01$
13. $0.009+200.763+3.924$
14. $5.001-.652$ $3.56-2.97$
15. $2498.06-0.85$ $23.1-23.0$
16. 8×2.0867 7.91×4.02
17. 8.93×40.02 3.98×209
18. $346.32\div18$ $778.26\div.007$
19. $96.621\div9.03$ $6\div.0375$
20. $64.016\div1.6$ $.4263\div.029$

Find the missing numbers.

21. 5% of 480 = ☐
22. 17% of 2 = ☐
23. 18% of 3.2 = ☐
24. 1.5% of 72 = ☐
25. 7% of ☐ = 21
26. 50% of ☐ = 4150
27. 28% of ☐ = 7
28. $66\frac{2}{3}\%$ of ☐ = 8
29. 72 is ☐% of 80
30. $\frac{1}{4}$ is ☐% of 20
31. 105 is ☐% of 15
32. 12 is ☐% of 9

33. The regular price of a suit was $67.50. It was sold at a discount of 8%. What was the sale price? ($50.00; $57.25; $62.10)

How Well Have You Learned?

1. Sue's account for May is shown below. What is the balance on hand on June 1?

CASH ON HAND: May 1, $7.23.

RECEIPTS: May 3, baby-sitting, $1.25; May 9, helped Mrs. Jones, 75¢; May 17, baby-sitting, $1.25; May 23, helped Mrs. Jones, $1.60.

EXPENDITURES: May 5, movie, 75¢; May 12, scarf, $1.35; May 15, gift, $3; May 24, books, $1.95.

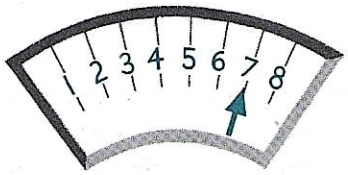
2. Find the total cost of —
5 qt. of oil @ 35¢ a quart
Greasing car, $1.50
Wash and polish car, $3.50
Tire repair, $2.75

3. Mr. Hale earns $474 a month. These amounts are deducted from his pay: income tax, $69.60; social security, $9.48; city tax, $2.37; hospital insurance, $4.75; pension, $8. How much is his take-home pay?

4. Mr. Erb has take-home pay of $290 per month. The graph below shows how it was used. How much was spent for each item?

SHELTER	CLOTHES	FOOD	OTHERS
22%	20%	30%	28%

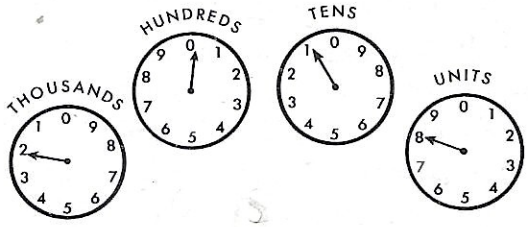
5. A family should not spend more than 25% of its income for



shelter. One family has an income of $320 a month. Should they pay $85 a month for shelter? Explain.

6. Mr. Dale uses an average of 28 gal. of gasoline a week. He was paying 30¢ a gallon. He now uses another brand that costs $27\frac{1}{2}$¢ a gallon. How much will he save per year by using the cheaper gasoline?

7. The electric meter reading on June 1 was 1871. The July 1 reading is shown in the picture below.



Use the following rates to find the electric bill for June.

First 20 KWH or less $1.00
Next 20 KWH = 3.45¢ per KWH
Next 160 KWH = 2.45¢ per KWH

8. The gas meter readings tell the number of CCF.

PREVIOUS READING	PRESENT READING	COST MCF	DISCOUNT ALLOWED
473	535	$1.25	4%

Find the amount of gas used, the gross bill, and the net bill.

Help Yourself to Improve

1. Mr. Hall's income is $4800 per year. Deductions from his salary totaled $310 per year. What would be a reasonable sum to spend each month for food? Clothing? Rent? (252, 253, 254, 255, 256)

2. The Smith family wishes to purchase a house. What is the most that they should pay if their total income is $7500 per year? (253)

3. A store advertised canned corn for $4.08 per case (24 cans). This price was 15% less than the regular price per can. What was the regular price per can? What was the sale price per can? (254)

4. A family uses 5800 cu. ft. of water during a three-month period. Use the rate given below to find the amount paid each three months. (263)

First 1200 cu. ft. $3.00 minimum
Next 4800 cu. ft. @ 20¢ per 100 cu. ft
Over 6000 cu. ft. @ 15¢ per 100 cu. ft

5. Mr. Dean bought a house for $10,500. He could have invested this money at $4\frac{1}{2}\%$ interest. Taxes, repairs, and insurance on the house cost $600 per year. How much per year does it cost Mr. Dean to own the house? (253)

6. Next year Bill's income will be $2500. How much of this should be used for shelter? For clothes? For food? (251)

7. The regular price of a suit is $85. The sale price is 25% less than the regular price. What is the sale price? (256)

8. Find the amount of gas used, the gross bill, and the net bill. (261)

PREVIOUS READING	PRESENT READING	COST PER MCF	DISCOUNT
817	946	$1.35	$3\frac{1}{2}\%$

9. The rates of one gas company are:

4 CCF, or less	75¢
Next 6 CCF	15¢ per CCF
Next 30 CCF	12¢ per CCF
Next 60 CCF	8¢ per CCF

What is the gross bill for the use of 96 CCF? (262)

10. The Lewis family used 225 KWH of electricity last month. Find the cost. (265)

11. Mrs. Lee used a 1250W ironer 6 hr. last month. How many KWH was this? (264)

12. How many hours are needed for a 50W bulb to use 1 KWH? (264)

13. A dress for a little girl is regularly priced at $3.96. The sale price is $2.97. What is the per cent of the discount? (256)

Show That You Know

1. A family of four has $3000 a year for consumer goods. What is a reasonable amount to use for shelter? For food? For clothes?

2. The whole income of a family is $5000 a year. They pay 24% of this as taxes, and save $300 a year. How much is left for consumer goods?

3. A table is marked $65. Chairs are marked $11.75 apiece. Mrs. Stone bought the table and four chairs at a discount of 20%. What was the total cost?

4. Milk is 21¢ a quart in 1-quart bottles, and is 36¢ per 2-quart bottle. What is the saving on 90 qt. of milk bought at the lower price?

5. In making a bookcase, Billy needed six boards, each 3 ft. 4 in. long and 12 in. wide. What will the lumber cost at 18¢ per board foot?

6. Connie bought $5\frac{1}{3}$ yd. of gingham to make four aprons. How much was this for one apron?

7. Fresh bread is 23¢ a loaf. Day-old bread is 12¢ a loaf. A family uses 4 loaves a week for toast. How much could they save per year by using day-old bread?

8. These are the living expenses of one family. Find the per cent each item is of the total.

Food	$1500	Shelter	$1250
Clothes	$ 350	Other	$1900

9. Find the gross cost of 55 CCF of gas at $1.20 per MCF.

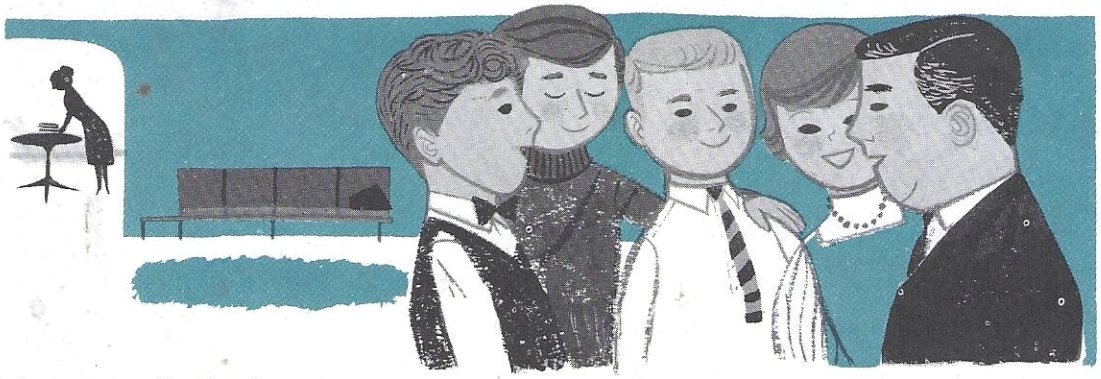
10. The cost of electricity is 2.5¢ per KWH. Find the cost of using a $\frac{1}{3}$ HP motor (400W) for 2 hr.

11. A state income tax is $2\frac{1}{2}\%$ of a family's net income. The tax amounted to $65 last year. What was the family's net income last year?

12. The table below shows the yearly income of four families. In each case, the income is received in equal monthly payments. Deductions from their monthly incomes are also shown. Find the take-home pay for each family. Make a budget for each family showing a reasonable amount to be spent every month for food, clothing, and shelter.

	YEARLY INCOME	MONTHLY DEDUCTIONS
King	$5220	$57.90
Adams	$3810	$38.40
Moore	$4200	$44.00
James	$4730	$50.00

MERRY
LAND



Adventure in Business

FATHER: There is a "For Sale" sign on Gray's Amusement Park.

TED: How much is it worth, Dad?

FATHER: The ground is worth about $250 an acre. I don't know how much Mr. Gray has spent on improvements. Its real value depends altogether on how much money it will make. Mr. Gray has been losing money. That is why he wants to sell.

BOB: Let's buy it. Help us plan, Dad. We'll do the work. It will be fun.

FATHER: The fun won't last long if the business is all work and no profit. We will have to do some good, hard thinking first. I have a report on profits from such parks. Mr. Gray said that when he opened the park three years ago, there were 135 amusement businesses in the state. Since then, 81 others have been started. In these three years, 108 amusement businesses have failed.

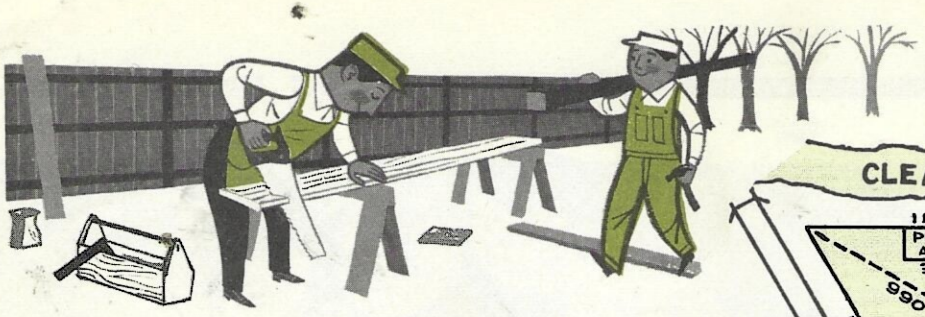
1. What per cent of the total number of amusement businesses have failed in the three years? What per cent have stayed in business?

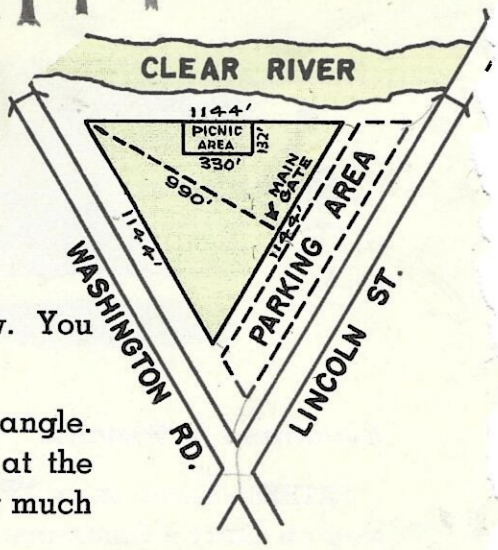
2. The businesses that failed were sold at an average loss of 52% of their value. What was the loss on a business valued at $7000? What was the selling price?

BOB: Let's hear about the profits of the businesses that did not fail.

FATHER: Turtle Lake Park cost $12,000. After two years, the owner was offered $21,000 for it.

3. What was the per cent of gain in value of Turtle Lake Park in the two years?





Appraising the Property

Keep your answer to each problem below. You may need it to help you solve later problems.

1. Gray's Park is shaped like an equilateral triangle. The dimensions are as shown in the drawing at the right. What is the area of the park in acres? How much is the ground worth at $250 an acre?

2. Mr. Gray had a solid fence six feet high built around the park. Each fence board was 1 inch thick, 12 inches wide, and 6 feet long. How many board feet of lumber were there in each fence board? How many fence boards were needed to go around the park? Find the cost of the lumber at $7.50 per 100 board feet.

3. The fence posts were eight feet apart. How many posts were needed? What was the cost of the posts at $2.24 apiece?

4. The fence boards were nailed to three runners that extend from post to post. How many runners were there in all? What was the total length of all the runners used? Find the cost of the runners at $7\frac{1}{2}$¢ per linear foot.

5. Each runner was 8 feet long. It took four 20-penny nails to nail a runner to two posts. Twelve 20-penny nails make a pound. How many pounds of 20-penny nails were used to nail all the runners to the posts? Find the cost of the nails at 14 cents a pound.

6. The fence boards were nailed to the runners. These nails were 4 inches apart. There are 28 nails in a pound. How many pounds of these nails were needed? What was the cost of these nails at 14 cents a pound?

7. Hinges for the gates and other hardware cost $75. What was the

total cost of materials needed for enclosing the park? Add 10% to the answer to allow for waste or loss.

8. It took a workman an average of 40 minutes to dig a hole and set a post. He was paid at the rate of $9.60 for an 8-hour day. What was the average cost of digging one hole and setting the post? What was the cost of digging holes and setting all the posts?

9. Mr. Nash charged $300 for the labor used to nail runners and fence boards, and to build the gates. He and two helpers worked 10 days each. Mr. Nash paid himself $12 a day. He divided the remainder equally between his helpers. How much did each helper receive?

10. Find the total cost of —

Plumbing material $128.40
Plumber
38 hours @ $2.25 an hour
Electrical materials $243.75
Electrician
144 hr. @ $2.40 an hour
Material for grandstand
$355.80
Labor for building grandstand
$296.45

11. Problems 2-10 gave the costs of different improvements. Find the total cost of all these improvements.

The improvements lost 40% of their value in three years. What, then, is the present value of the improvements?

12. Find the total cost of the following:

32 small tables @ $12.50
64 small benches @ $7.50
3 large tables @ $29.95
120 chairs @ $4.75
12 concession booths @ $85

13. The items in problem 12 decreased 60% in value in three years. What is their present value?

14. What is total present value of the park? (Problems 1, 11, 13)

15. A fence post is 4″ × 4″ × 8′. How many board feet of lumber are in one fence post? What is the cost per board foot if a post costs $2.24? What is the cost per 100 board feet?

16. At a cost of $7\frac{1}{2}$ cents per linear foot, what is the cost of one 8-foot runner?

17. The runners are 2″ × 4″ × 8′. How many board feet are in one runner? Using the cost of a runner found in problem 16, what is the cost per board foot? Per M (1000 board feet)?

Appraising the Prospects

FATHER: Mr. Gray will sell the park for $5000 cash. It will take $4000 more to get it ready for business.

JOAN: Help us get the money, Dad. We will clean and paint everything, and call it Merry Land. It will be the nicest place for miles around for parties, picnics, ball games, and everything. I know that we can make lots of money.

FATHER: It will take some careful figuring and planning.

1. Joan and her father wrote down the fixed expenses. Find the amount of each item and the total.

Interest: $9000 @ 6% . . . . .
Taxes: $7500 valuation
at $2.35 per $100 . . . . .
Insurance: $8000
at $4.25 per $1000 . . . . .
Liability insurance: $20,000
at $22.50 per $1000 . . . .
Total: . . . . .

2. Find out all you can about liability insurance. Why would Merry Land need liability insurance?

FATHER: Besides interest, taxes, and insurance, another $1000 a year will be needed to keep fences, buildings, and furniture repaired and painted. Besides all the work we do, it will cost us $1500 a year for help in selling and cleaning up. Our risk and work ought to be worth at least $5000 a year.

3. What is the sum of the amounts father mentioned? What is the total of these amounts plus the interest, taxes, and insurance mentioned in problem 1?

TED: Mr. Gray said they sold $60 worth of candy and balloons at one stand in one day. The profit was $20.

FATHER: $20 was the difference between selling price and cost of what they sold. That is not all profit. A fair rent for the stand and ground around it is $6 a day. Licenses and business taxes cost another $1 a day. The man who did the selling was paid $10 a day.

4. About how much was the actual profit made at the stand in one day?

JOAN: We can get our school to have its picnic there. Last year the pupils spent an average of $1.25 apiece at their picnic. There are 600 pupils. We can price things to make 25¢ on each $1 worth we sell. This gain of 25¢ per dollar will cover our profit and the hidden expenses.

5. How much would Merry Land make on the school picnic if Joan's plans can be carried out?

6. About 16,000 pupils are in school within twelve miles of Merry Land. If 25% of them have their picnics at Merry Land, and if they spend as pupils from Joan's school spend, how much can Merry Land make from school picnics?

BOB: We can make good profit on popcorn. Mr. Gray showed me his figures.

7. Popcorn, butter, salt, and bags for a 5-cent bag of popcorn cost only 1.9¢. Not counting heat, light, labor, and other costs, how much will Merry Land make in selling 100 5-cent bags?

8. The cost of materials for a 10-cent bag of popcorn is 3.3¢. How much will Merry Land make in selling 100 10-cent bags of popcorn?

9. The popcorn and sirup for a popcorn ball costs 3.2¢. Merry Land will sell the balls at 8¢ each or two for 15¢. How much will Merry Land make in selling 60 balls at 2 for 15¢? In selling 40 balls at 8¢ each?

JOHN: We can do even better with lemonade than with popcorn. Mr. Gray showed me his figures on that.

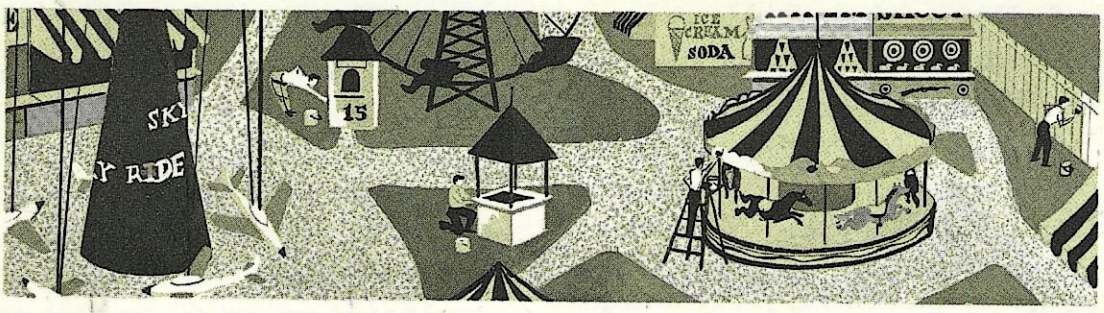
10. Find the cost of four dozen lemons at 30¢ a dozen and 9 pounds of sugar at 8¢ a pound.

Six gallons of water and 25¢ worth of ice with the lemons and sugar will make 100 glasses of lemonade. It will sell for 5¢ a glass. How much can Merry Land make in selling 100 glasses of lemonade?

Practice with Per Cents

Find the missing numbers.

1. $87\frac{1}{2}\%$ of 500 = ☐
2. 14% of 43 = ☐
3. 119% of 139 = ☐
4. 500% of 111 = ☐
5. 200% of $\frac{1}{2}$ = ☐
6. 27 is ☐ % of 810
7. 55 is ☐ % of $5\frac{1}{2}$
8. 777 is ☐ % of 2331
9. $1\frac{1}{2}$ is ☐ % of 9
10. 100 is ☐ % of 450
11. 40 is 10 % of ☐
12. 54 is 6 % of ☐
13. 144 is 36 % of ☐
14. 11 is $33\frac{1}{3}\%$ of ☐
15. 50 is 200 % of ☐



Painting and Repairing

FATHER: Now that we have bought the park, there is hard work for all of us. Our first job is to get everything fixed up to do business at a profit.

1. The distance around Merry Land is 3432 ft. The fence is 6 ft. high, and must be painted on both sides. What is the total area to be painted?

2. Count the whole area of the fence boards as about 42,000 sq. ft. A gallon of paint will cover about 350 sq. ft. with two coats.

How many gallons of paint are needed for two coats for both sides of the fence? How much will the paint cost at $4.95 a gallon?

3. About $\frac{1}{12}$ as much paint is needed for posts and runners as for fence boards. How many gallons are needed for posts and runners? How much will it cost at $4.95 a gallon?

4. At $4.95 a gallon, find the cost of paint for the following items:

Grandstand — 10 gal.
Booths and Stands — 12 gal.
Furniture — 6 gal.
Boathouse — 3 gal.

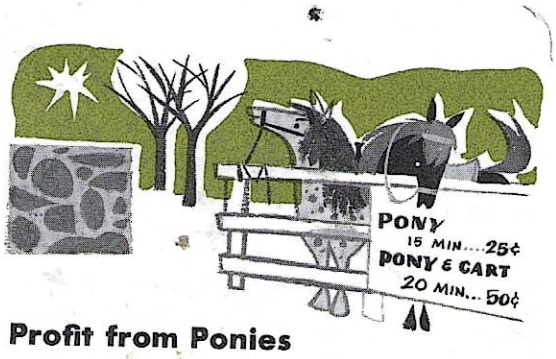
5. Gravel is $3.60 per cubic yard. Find the cost of enough gravel to make a walk 30 ft. long, 6 ft. wide, and 4 in. thick.

6. Ted made a large scale drawing of Merry Land, similar to the drawing on page 272. Each side of the park was 8 inches long on his drawing. What scale did he use? (1 in. stands for 2 ft.)

What was the distance on Ted's drawing from the main gate to the opposite corner?

7. Joan made a smaller scale drawing of Merry Land. She let 4 in. stand for each of the sides. What scale did she use?

8. Make a scale drawing of Merry Land. (Scale: 1 in. = 572 ft.)



Profit from Ponies

JOHN: Merry Land can have ponies to rent without having to buy them. Green Valley Stables will rent them to us, and we can rent them at a profit. Green Valley will charge us $2 a day for a pony, or $3.20 a day for a pony and a cart.

1. At $2 a day (8 hr.), what rate per hour will Merry Land have to pay for a pony?

2. Because a pony must rest, and because Merry Land will not have customers for all the ponies all of the time, John figured that the ponies would be busy for an average of two 15-minute periods every hour. At 25¢ for a 15-minute ride, how much will a riding pony bring in per day? At this rate, how much profit will there be per pony?

3. At $3.20 a day (8 hr.), what rate per hour will Merry Land have to pay for a pony and cart?

4. John found that each pony and cart would also be busy only about half the time. At 50¢ for a 20-minute ride, how much will a pony and cart bring in per 8-hour day? At this rate, how much profit will a pony and cart bring in per day?

FATHER: If our information is correct, we can figure that a riding pony will bring in $2 more than we have to pay to Green Valley Stables. A pony and cart will bring in $2.80 more than we pay to the stables. Merry Land will have to pay $10 a day for someone to take care of the ponies and rent them out. It will cost us $4 a day to provide space for them.

5. What will be the total daily cost in addition to the cost of renting the ponies from Green Valley Stables? How many ponies would be needed just to cover these costs? How many ponies and carts would cover the added expenses?

6. How much rent would Merry Land collect from 8 riding ponies and 8 ponies and carts working for half an 8-hour day? How much of this would have to be paid to Green Valley Stables? How much would be paid to the person who took care of the ponies? How much would be set aside for rent of space? How much would Merry Land clear?

Going to the River for Profit

TED: Clear River is fine for boating and swimming. A dock, boathouse, and locker room will cost about $1000.

BOB: Boats cost $75 each, and swimming suits are $2.25 apiece.

1. Find the cost of 6 boats and 24 swimming suits.

2. Depreciation on boats and swimming suits is 25% a year. On dock, boathouse, and locker room it is 10% a year. What is the total depreciation a year on dock, boathouse, locker room, 6 boats, and 24 swimming suits?

3. Find the sum of these yearly expenses: depreciation, $226; interest at 6% on $1504; insurance, $75.

TED: I figure that we can rent each boat an average of 400 hr. a year, at 50¢ an hour. We will allow $12\frac{1}{2}\%$ of this for fixed expenses, 25% for upkeep, and $37\frac{1}{2}\%$ for a boat attendant. The rest will be profit.

4. How much does Ted expect to take in from the six boats? What yearly profit does he expect?

5. Find the amount that Ted allowed for fixed expenses. For painting and repair. For taking care of the boats.

6. Suppose that Ted can rent each boat an average of only 240 hr. a year, at 50¢ an hour. Suppose that the costs are as follows: fixed expenses, $150; upkeep, $300; boat attendant, $450. What will be the yearly profit or loss from the six boats?

7. Suppose that Ted can rent a boat an average of 400 hr. a year only by reducing the rent to 35¢ an hour. Suppose that the costs are the same as given in problem 6. What will be the yearly profit or loss from the six boats?

8. For rent of a swimming suit, a towel, and a locker, Merry Land charged 75¢ on week days and $1 on Sundays. Rent of a locker only was 50¢. During one week Merry Land rented 162 suits, towels, and lockers at 75¢ and 32 at $1. A total of 196 lockers were rented at 50¢. What was the total amount received?

9. During the same week Merry Land paid a lifeguard $8 a day and a locker attendant $7.50 a day. 194 towels were laundered at 5¢ each, and 194 suits were sterilized at 7¢ each. What were the total expenses? What was the margin?

Parking Profits

1. What was the charge for a car parked at 9:18 A.M. and taken from the lot at 10:30 A.M.?

THINK: From 9:18 to 10:18 is 1 hour, and the charge is ? ¢. From 10:18 to 10:30 is less than 1 hr., but counts as an additional hour. The charge is ? ¢. The total charge is ? ¢.

2. A car was parked at 7:10 A.M. and taken from the lot at 3:35 P.M. What was the charge?

Find the charge for each of the following:

	IN	OUT	IN	OUT
3.	8:40 A.M.	9:30 P.M.	7:15 A.M.	11:00 A.M.
4.	6:30 A.M.	5:00 P.M.	6:30 P.M.	MIDNIGHT
5.	7:00 A.M.	7:00 P.M.	11:10 A.M.	6:00 P.M.
6.	9:30 A.M.	12:30 P.M.	11:15 P.M.	11:55 P.M.

7. The lot has spaces for 40 cars. Father found that an average of $1.25 was collected per space per day. How much did the lot bring in per day?

8. The parking attendants were paid a total of $20 per day. Other costs amounted to $10 a day. How much, then, did Merry Land clear per day from the lot?

MERRY L
Merry Land
PARKING
FIRST HOUR 35¢
EACH ADDITIONAL HOUR OR FRACTION OF AN HOUR . . . . . 25¢
ALL DAY $1.25
(6 HOURS OR MORE)
LOT CLOSES AT MIDNIGHT

Mixed Practice

1. $\begin{array}{r} 833 \\ 8407 \\ 675 \\ 9014 \\ 72 \\ +1448 \end{array}$ $\begin{array}{r} 324 \\ 705 \\ 928 \\ 631 \\ 540 \\ +992 \end{array}$ $\begin{array}{r} 3\frac{1}{2} \\ 6\frac{2}{3} \\ 5\frac{3}{8} \\ 2\frac{3}{4} \\ +9\frac{1}{3} \end{array}$ $\begin{array}{r} \frac{1}{10} \\ \frac{3}{4} \\ \frac{1}{3} \\ \frac{5}{6} \\ +\frac{2}{5} \end{array}$

2. $59\overline{)3599}$ $36\overline{)17.28}$ $4.8\overline{)144}$

3. $\begin{array}{r} 1742 \\ \times 60 \end{array}$ $\begin{array}{r} 845 \\ \times 903 \end{array}$ $\begin{array}{r} 7.75 \\ \times 8 \end{array}$ $\begin{array}{r} 3.45 \\ \times 6.2 \end{array}$

4. $\begin{array}{r} 94{,}131 \\ -75{,}032 \end{array}$ $\begin{array}{r} 181{,}468 \\ -90{,}559 \end{array}$ $\begin{array}{r} 827\frac{1}{4} \\ -818\frac{1}{2} \end{array}$

5. $18\frac{3}{4} \div 3$ $6\frac{3}{4} \times 2\frac{2}{3}$ $22\frac{1}{2} - 16\frac{3}{4}$

6. $14\frac{7}{8} + 3\frac{1}{3}$ $5\frac{1}{7} \times 3\frac{1}{4}$ $12\frac{3}{4} \div \frac{3}{8}$

7. $\begin{array}{r} 24.7 \\ +19.8 \end{array}$ $\begin{array}{r} 60.1 \\ +87.9 \end{array}$ $\begin{array}{r} 301.6 \\ -27.9 \end{array}$ $\begin{array}{r} 23.8 \\ -22.9 \end{array}$

8. 24.89×147.06 2.005×26.6

9. $243.0624 \div 16$ $97.2531 \div 3.87$

Thursday, June 29

(a) = Left over from yesterday
(b) = Received today
(c) = Spoiled or wasted
(d) = Left at end of day

Milk

(a) 26 bottles @ 8¢ =
(b) 120 bottles @ 8¢ =
(c) 2 bottles @ 8¢ =
(d) 32 bottles @ 8¢ =

Soda

(a) 47 bottles @ 7¢ =
(b) 216 bottles @ 7¢ =
(c) 5 bottles @ 7¢ =
(d) 62 bottles @ 7¢ =

Pies

(a) 3⅓ pies @ 90¢ =
(b) 24 pies @ 90¢ =
(c) ⅙ pie @ 90¢ =
(d) 2½ pies @ 90¢ =

Cakes

(a) 1¼ cakes @ 1.20 =
(b) 15 cakes @ 1.20 =
(c) ½ cake @ 1.20 =
(d) 1¾ cakes @ 1.20 =

Ice Cream (Quarts @ 60¢, pints @ 35¢)

(a) 3 qt. . . 2 pt. . . . =
(b) 40 qt. . 40 pt. . . =
(c) 1 qt. . . 0 pt. . . =
(d) 2 qt. . . 5 pt. . . =

Keeping Accounts

1. Copy Joan's accounts and fill in all missing numbers.

2. Find the total value of the goods left over from yesterday (a).

3. Find the total value of the goods received today (b).

4. Find the total value of the goods spoiled or wasted (c).

5. Find the total value of goods left at the end of the day (d).

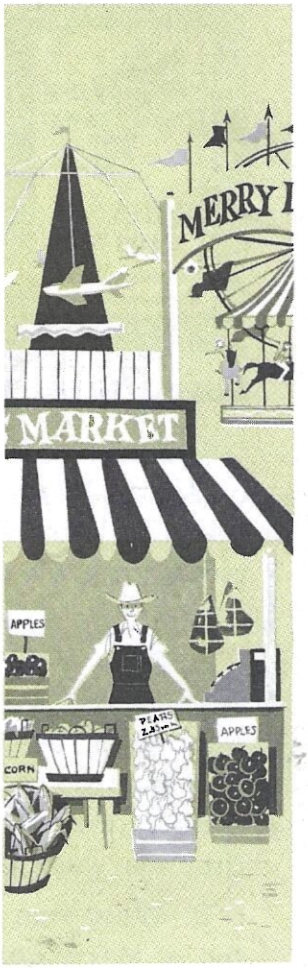
6. Joan's accounts for Tuesday listed the following total amounts: (a) $28.40, (b) $124.75, (c) $3.10, (d) $31.50. Find the total value of the goods sold in Joan's refreshment stand on Tuesday.

▶ A good accountant saves all his answers because he may need them in solving other problems. If you saved your answers for problems 1-5, problem 7 will be easy.

7. Find the total value of the goods sold in Joan's stand on Thursday, June 29.

Renting Market Stands

Farmers rent market stands from Merry Land. The rent is 10 per cent of the money taken in at the stand. Bob keeps a record of the goods sold at each stand.



1. During one week Mr. Grimes sold the goods listed below. How much rent did he pay for his stand?

24 bu. red Delicious apples @ $3.60 per bu.
18 bu. Baldwin apples @ $3.85 per bu.
36 bu. Winesap apples @ $3.05 per bu.
42 bu. Jonathan apples @ $2.90 per bu.
9 bu. winter pears @ $2.35 per bu.
226 lb. fresh ham @ $57\frac{1}{2}¢$ per lb.
184 lb. pork shoulders @ $48\frac{1}{2}¢$ per lb.
98 lb. sausage @ $62¢$ per lb.
6 hams (total weight, 68 lb.) @ $56¢$ per lb.

2. What rent did Mr. Mason pay for the week during which he sold the following goods?

128 bu. yellow corn @ $1.75 per bu.
84 bu. white corn @ $1.65 per bu.
180 lb. popcorn at $12\frac{1}{2}¢$ per lb.
38 bags corn meal @ $65¢$ per bag
88 pk. sweet potatoes at $1.05 per pk.
700 lb. cabbage at $6\frac{1}{2}¢$ per lb.
195 lb. white potatoes @ 15 lb. for $35¢$

3. What was the total income for Merry Land from both stands?

4. Expenses on each of the stands, including depreciation, upkeep, and electricity, amounted to $1.05 per day. What were the total expenses for both stands for one week? What was Merry Land's profit?

5. The space taken up by the stands had been parking space for 12 cars. Bob took $1.25 per day per car from the profit on the stands. How much was this?

6. Figuring the loss in parking fees, what did Merry Land actually gain or lose on the market stands? (Use answers to problems 1-5.)

Making Picnics Pay

1. An area 330′ × 132′ was set aside at Merry Land for picnic grounds. What was the area of the picnic grounds in square feet? In acres?

2. Each picnic ground was 4 rods square. How many feet square was each picnic ground? What was the area in square feet of each picnic ground? How many picnic grounds were there altogether?

3. What was the cost of picnicking at Merry Land for 4 hours? For $1\frac{1}{2}$ hours? For 3 hours? Why do you think there was a minimum charge of $3?

4. Each picnic ground had an outdoor fireplace that cost $84.75, a long table costing $32.50, and two benches at $13.75 each. What was the total cost of these items for ten picnic grounds?

5. Ted learned that fireplaces depreciate 20% the first year, 15% a year for the next two years, and 10% a year for the next five years. What was the depreciation on the 10 fireplaces the first year? The second year? The fourth year?

6. Tables and benches depreciate 40% the first year, and 20% a year for the next three years. What was the depreciation on tables and benches for ten picnic grounds the first year? The second year? The fourth year?

7. What was the total depreciation on all fireplaces, tables, and benches by the end of the third year? (See problems 4-6.)

8. Out of every $3 collected for use of the grounds, 75¢ goes for rent of space and equipment, $1 for depreciation of equipment, 50¢ for firewood and water, and 75¢ for keeping grounds and equipment clean. What per cent of the $3 is allowed for each item?

9. Make a circle graph to show the distribution of the $3 itemized in problem 8.

10. A third of the total income from picnic grounds is for depreciation of equipment. What must be the income the first year to cover a depreciation of $409.50?

No Pencils, Please

Find the cost of each order:

1. Two kites
2. Cane; softball
3. Bat; small ball
4. Four small candy bars; soda
5. Two large candy bars; small ball; three packages of gum
6. Four small candy bars; snow cone; large ball
7. Kite; marbles; cotton candy
8. Softball; popcorn
9. Peanuts; marbles
10. Three packages of chewing gum; balloon; snow cone
11. Six large candy bars
12. A dozen small candy bars
13. A large ball; small ball
14. Seven bags of popcorn; soda
15. Three balloons; three ice creams; three packages of gum
16. Bat; ice cream; cotton candy
17. Large ball; cane
18. Softball; ice cream
19. Two balloons
20. Two bats
21. Popcorn; marbles
22. Four small candy bars; cane
23. Softball; marbles
24. Four bags popcorn; four sodas; four small candy bars
25. Large ball; two kites
26. Bat; two small balls
27. Two ice creams; cookies
28. Three bags of marbles
29. Two softballs; peanuts
30. Two large candy bars; ice cream; soda; cane

Refreshment Stand Profits

1. Merry Land uses a size 20 scoop in selling ice cream. There are 20 scoops in a quart. Ice cream is $1.40 a gallon wholesale. What is the wholesale cost of a scoop of ice cream?

2. Small cones cost Merry Land $1 a hundred. Merry Land sells a scoop of ice cream in a small cone for 5¢. How many small cones are needed to serve a gallon of ice cream? (See problem 1.) What is the cost of this number of cones?

3. For how much more than cost of ice cream and cones does Merry Land sell a gallon of ice cream?

4. A carton of 500 large cones costs $6.25. What is the cost of one large cone? What is the cost to Merry Land of one large cone and two scoops of ice cream?

5. Merry Land sells a large cone and two scoops of ice cream for 10¢. What is the gain? The gain is what per cent of the selling price?

6. Salted peanuts are 80¢ a box (24 packages) wholesale. Merry Land sells the salted peanuts at 5¢ a package. What is the gain in selling 24 packages? The gain is what per cent of the selling price?

7. Large candy bars are $1.50 a box (24 bars) wholesale. Merry Land sells these at 2 for 15¢. What is the gain in selling 12 boxes of large candy bars?

8. The wholesale cost of a case of soda (24 bottles) is 80¢ plus 48¢ deposit for bottles plus 12¢ deposit for the case. It costs Merry Land about 1¢ a bottle to get the soda ice cold for sale. About $\frac{1}{3}$ of the bottles are not returned. How much does Merry Land gain in selling a case of soda at 7¢ a bottle?

9. A pie is 45¢ wholesale. Merry Land cuts the pie into six pieces and sells the pieces at 15¢ each. The paper plate and wood spoon used to serve a piece of pie cost about 1¢. What is the gain on one pie? What per cent is the gain of the selling price?

10. Cakes cost 60¢ each wholesale. Merry Land cuts a cake into tenths, and sells it at 12¢ a piece. The gain is what per cent of the selling price?

Profit from Coffee and Tea

1. A 5-pound bag of coffee will make 240 cups of coffee. How many pounds of coffee are needed to make 96 cups? How much will this cost at 90¢ a pound?

2. There are about 6 teaspoonfuls in one ounce of sugar. Figuring 2 teaspoonfuls to a cup of coffee, how much sugar will be needed for 96 cups? How much will this cost at 8¢ a pound?

3. Figure an average of 1 tablespoonful of cream to a cup of coffee. What is the cost of cream for 96 cups of coffee if cream costs 45¢ a pint?

4. Paper cups cost $1\frac{1}{4}$¢ each. What is the total cost of serving 96 cups of coffee? (Use your answers to the problems above.) What is Merry Land's gain in serving 96 cups at 10¢ a cup?

5. One hot day Merry Land prepared 96 cups of coffee at a cost of $4.51. Only 40 cups were sold that day, at 10¢ a cup. What was the gain or loss?

6. Merry Land charges 10¢ for a serving of hot tea. A serving includes a paper cup ($1\frac{1}{4}$¢), a pint pot of hot water, a tea bag (9¢ per dozen), an envelope of sugar (1¢), and $\frac{1}{4}$ of a lemon (30¢ per dozen). What is the cost to Merry Land of a serving of hot tea? What is Merry Land's gain on a serving?

7. Merry Land sells a tall glass of iced tea for 10¢. The total costs for 80 glasses of the tea are 80¢ for tea, 50¢ for ice, 60¢ for lemons, and 30¢ for sugar. What is the cost of making 1 glass of iced tea? How much does Merry Land gain in making and selling 80 glasses of iced tea?

8. Which brings the greatest gain, a serving of hot tea, coffee, or iced tea? (See problems 1-7.)

Sandwich Stand Profits

Merry Land buys sandwich bread wholesale at 16¢ a loaf. There are 32 slices in a loaf.

Cold meat or cheese for sandwiches averages about 60¢ a pound. Merry Land uses an ounce of cold meat or cheese in making a sandwich.

The lettuce, pickle, mayonnaise, mustard, etc., that may be used cost about 1¢ per sandwich.

1. What is the cost of materials for 12 dozen cold meat or cheese sandwiches?

2. Merry Land sells cold meat and cheese sandwiches at 15¢ each. How much does Merry Land gain in selling 12 dozen cold meat or cheese sandwiches?

Large round rolls are 30¢ a dozen. Ground steak is 64¢ a pound.

Merry Land uses a large round roll, 3 ounces of ground steak, and 1¢ worth of chopped onions to make a sandwich.

3. What is the cost of materials for a dozen steak sandwiches?

4. A ground steak sandwich is sold for 25¢. What does Merry Land gain in selling 2 dozen steak sandwiches?

A pork roast costs 45¢ a pound. Merry Land has found that a 6-pound pork roast is enough for 20 sandwiches.

5. What is the cost of the roast pork used in one sandwich?

6. Merry Land sells a pork sandwich for 30¢. The costs are pork, $13\frac{1}{2}$¢; large roll, $2\frac{1}{2}$¢; mustard or pickle, 1¢. What is Merry Land's gain in selling 15 pork sandwiches?

A beef roast is 56¢ a pound. Merry Land has found that a 6-pound beef roast will make 24 sandwiches.

7. What is the cost of the roast beef used in one sandwich?

8. Merry Land sells a beef sandwich for 35¢. The costs are beef, 14¢; large roll, $2\frac{1}{2}$¢; catsup, 2¢. What is Merry Land's gain in selling 24 beef sandwiches?

Wieners are 55¢ a pound. There are about 11 wieners to a pound. Long rolls are 27¢ a dozen. Mustard for one sandwich costs about 1¢.

9. What is the cost of materials for one wiener sandwich?

10. Merry Land sold 5 dozen wiener sandwiches at 15¢ apiece. What was the gain?

Profits from Carry-Out Service

1. Merry Land bought 50 watermelons at 55¢ each. An average of 10¢ worth of ice was used to chill a melon and keep it cold till sold. The stand sold 22 whole melons @ $1, 30 half melons @ 60¢, and 47 quarter melons @ 35¢. At closing time, everything that was left over was sold for $1. How much did Merry Land gain in selling the 50 watermelons?

2. Merry Land buys brick ice cream for $1.20 a gallon. A gallon is 4 quart-bricks, or 8 pint-bricks. One day the carry-out sales were 32 quart-bricks @ 60¢ and 48 pint-bricks @ 35¢. What did Merry Land gain on the ice cream sold that day?

These are costs and prices of other carry-out foods:

ITEM	COST	PRICE
Lemons	35¢ a dozen	5¢ each
Eggs	45¢ a dozen	5¢ each
Apples	50¢ a dozen	10¢ each

Find Merry Land's gain on the following:

3. 5 dozen lemons.

4. 8 dozen eggs.

5. 4 dozen apples.

6. Merry Land buys sugar cookies from a bakery at 60¢ a pound. There are 48 cookies to a pound. Merry Land sells the cookies at 2¢ each. How much is the gain in selling 5 pounds of cookies?

7. Merry Land pays $18 for a 60-pound bag of roasted peanuts. Peanuts sell for 45¢ a pound. What is the gain per pound of peanuts sold?

8. Merry Land buys bread at 16¢ a loaf. It sells at 15¢ per half loaf. A half-loaf is sold in a plastic bag that costs Merry Land 2¢. How much does Merry Land gain in selling 20 loaves of bread?

9. Merry Land pays 65¢ a pound for butter. It is sold at 25¢ per quarter pound. How much does Merry Land make on 12 pounds?

10. Merry Land paid $52\frac{1}{2}$¢ a pound for a ready-to-eat ham. The total cost was $6.30. How much did the ham weigh?

Sixteen $\frac{1}{2}$-pound packages of sliced ham were sold at 60¢ each. The bone and what meat was left on it were sold for $2. How much was the gain on the ham?

11. Sunflower seeds costing $3\frac{1}{2}$¢ per box were sold at 5¢ per box. What was the gain per box? What per cent was the gain of the cost?

Prices and Profits

1. The wholesale price of 12 dozen packages of salted peanuts was $11.20. There was a discount of 25%. It took 40 minutes of Ted's time and 40¢ in carfare to get the peanuts from the warehouse. Figuring Ted's time at $1.20 an hour, what was the actual cost of the peanuts as delivered at Merry Land? What was the cost per package?

2. Ted gave a boy $1 to walk among the picnickers selling salted peanuts at 10¢ a package. The boy sold 141 packages, lost 2 packages, and Ted allowed him to eat 1 package. After paying the boy, how much did Ted get for the peanuts that were sold?

3. Ted paid $9.60 for 12 dozen packages of salted peanuts. He sold them for $13.10. What was the margin?

Ted set aside 30% of the margin as overhead expense. The rest was net profit. What was the net profit from sale of the peanuts?

4. Ted could buy fresh roasted peanuts at 35¢ a pound. He got a 16% discount when he bought 100 lb. at one time. It cost $1 to have the peanuts taken from the roaster to Merry Land. What was the cost of 100 lb. of peanuts as delivered at Merry Land?

5. Ted had 100 lb. of peanuts put into 4-ounce bags. How many bags were needed? What did the bags cost at 25¢ per hundred?

6. Ted paid $29.40 for 100 lb. of peanuts, $1 to have them taken to the ball field, $2 to have them put into 4-ounce bags, and a commission of 10% to the boy who sold them. The boy sold 384 bags at 10¢ each. The others were lost or the bags were torn open. What was the total selling price of the peanuts? What was the boy's commission for selling them? How much

did Ted have left after he had paid all costs and expenses?

7. Ted bought 12 boxes of chocolate bars. There were 24 chocolate bars in a box. The list price was \$2 a box, with a discount of 30%. He paid 48¢ to have the boxes delivered. What was the total cost of the 12 boxes as delivered at Merry Land? What was the total cost of each chocolate bar?

8. Ted paid a boy a commission of 10% for selling chocolate bars at 10¢ each. The boy sold 284 chocolate bars. What was the boy's commission?

9. Ted paid \$17.28 for 288 chocolate bars. Four of them were lost or destroyed. He received \$25.56 from the sale of the others. What was his margin?

Ted set aside 25% of the margin as overhead for Merry Land. How much was the overhead? How much was the net profit?

10. Ted bought boxed popcorn at \$7.50 per 100 boxes delivered at Merry Land. He received a 12% discount. What was the cost of 400 boxes?

The loss and expense of selling amounted to 10% of the sales. What was the gain in selling 400 boxes at 10¢ a box?

Ted bought special ice cream at \$1.20 a gallon, with a discount of $12\frac{1}{2}\%$. A gallon of the ice cream made 80 single-dip cones or 40 double-dip cones. Large cones cost \$1.25 per 100 and small cones cost \$1.00 per 100. There was a discount of 8% on cones.

11. What is the cost of making 80 single-dip cones? At 5¢ each, what does Ted take in on 80 single-dip cones? What is his margin?

12. What is the cost of making 40 double-dip cones? What does Ted take in on double-dip cones which sell for 10¢ each? What is Ted's margin? What is the profit on 40 double-dip cones?

13. Which produces a greater margin, a gallon of the ice cream sold as single-dip cones or a gallon sold as double-dip cones?

14. Ted sold 15 gallons of the ice cream — 10 gallons in double-dip cones at 10¢ each and 5 gallons in single-dip cones at 5¢ each. What was Ted's total cost? What did he take in? What was the margin?

15. Ted set aside $33\frac{1}{3}$ per cent of the margin for overhead. What was the overhead on the 15 gallons of ice cream in problem 14? What was the profit? The profit was what per cent of the selling price?

How Well Have You Learned?

1. Mr. Burk paid $15,000 for Moonlight Park. He spent $10,000 in improving it. Business was poor. At the end of one year, he sold the park for $12,000. What was his loss? What per cent was the loss of the total cost of the park?

2. Fence posts are to be 8 ft. apart. How many are needed to make a fence $\frac{1}{2}$ mi. long?

3. Find the total cost of —

24 small tables @ $13.75 each.
48 benches @ $8.75 each.
6 large tables @ $31.25 each.
96 chairs @ $6.25 each.
8 concession booths @ $79.95 each.

4. How many board feet are in a piece of lumber 12 ft. long, 8 in. wide, and 2 in. thick?

5. The expenditures and receipts at the lemonade stand are shown below. What was the profit?

Expenditures - Lemonade Stand Account
6 doz. lemons @ 30¢ a dozen
15 lb. of sugar @ 9¢ a pound
150 paper cups @ 1¢ each
Ice 50 lb. @ 25¢ for 25 lb.
Receipts
150 cups of lemonade @ 5¢ each

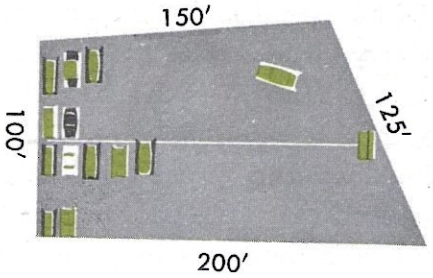
6. The value of outdoor furniture depreciates 40% the first year, and 20% a year for the next three years. On $3000 worth of new furniture, what is the total depreciation at the end of one year? Two years? Four years?

7. Gravel cost $3.75 per cubic yard. Find the cost of making a gravel walk 32 ft. long, 6 ft. wide, and $4\frac{1}{2}$ in. thick.

8. Mr. Stone pays 10% of his receipts to Merry Land as rent for his stand. How much is his rent when his sales are —

12 bu. peaches @ $3.25 per bu.?
15 bu. apples @ $3.75 per bu.?
9 bu. pears @ $2.75 per bu.?

9. A scale drawing of a parking lot is shown below. Find the scale that was used.



Help Yourself to Improve

1. A fence is made of vertical boards. The boards are 8 in. wide. How many boards are needed to make a fence 600 ft. long? (272)

2. Fence boards are 6 ft. long, 8 in. wide, and 1 in. thick. How many board feet are in one board? At $250 per M, what is the cost of 900 boards? (273)

3. A fence is $4\frac{1}{2}$ ft. high and 1200 ft. long. It must be painted on both sides. What is the total area to be painted? (276)

4. A gallon of paint will cover about 350 sq. ft. with two coats. How many gallons of paint are needed to cover both sides of a fence 700 ft. long and 6 ft. high with two coats? (276)

5. Fireplaces depreciate 20% the first year, 15% a year for the next two years, and 10% a year for the next five years. It cost $750 to build two fireplaces. What is their value at the end of three years? Six years? (282)

6. Boats cost $87.50 each, and swimming suits are $2.95 each. Find the total cost of 8 boats and 36 swimming suits. (278)

7. Materials used to make a sandwich cost 40% of the selling price of the sandwich. If materials cost 12¢, what should be the selling price of the sandwich? (286)

8. Doughnuts are 35¢ a dozen wholesale. Merry Land sells the doughnuts at 60¢ a dozen. A bag used in selling a dozen doughnuts costs 1¢. What is the gain on the sale of 18 doz. doughnuts? (284)

9. Apples are $2.30 a bushel wholesale. There are about 115 apples to a bushel. Merry Land sells the apples at 6¢ each. What is the cost per apple? What is the gain on the sale of 6 bu. of apples? (289)

10. Gravel is $3.25 a cubic yard. Find the cost of enough gravel to make a walk 6 ft. wide 6 in. deep and 60 ft. long. (276)

11. Find the cost per cup of coffee when the materials used in making and selling 96 cups are —

2 lb. coffee @ 95¢ a pound
2 lb. sugar @ $7\frac{1}{2}$¢ a pound
3 pt. cream @ 50¢ a pint
96 paper cups @ 15¢ a dozen
Gas for heat, 5¢ (285)

12. Small candy bars are 66¢ a box (24 bars). They are sold at 5¢ each. What per cent of the selling price is the profit? (284)

Show That You Know

Write the answers only.

Find the cost of 24 when the price is —

1. 3 for 10 cents
2. 4 for 15 cents
3. 6 for 25 cents
4. 8 for 35 cents

The list price and discount are given. Find the net price.

5. \$7.50, with 20% off
6. \$3.60, with 25% off
7. \$6.00, with $33\frac{1}{3}\%$ off
8. \$8.00, with $6\frac{1}{4}\%$ off
9. \$4.00, with 15% off

Find the cost of these amounts of milk —

10. 10 pt. @ 13¢ each
11. 8 qt. @ 25¢ each
12. 7 qt. @ 23¢ each
13. 12 bottles @ 7¢ each
14. 24 bottles @ 6¢ each

The cost and selling price are given. Find the margin.

15. \$15, cost; \$18.75, S.P.
16. \$7.50, cost; \$9.15, S.P.
17. \$33.75, cost; \$42, S.P.
18. $\$.18\frac{3}{4}$, cost; \$.25, S.P.
19. $6\frac{2}{3}$¢, cost; 10¢, S.P.

The margin and selling price are given. What per cent is the margin of the selling price?

20. \$3, margin; \$10, S.P.
21. \$2, margin; \$6, S.P.
22. 5¢, margin; 50¢, S.P.
23. $6\frac{1}{4}$¢, margin; 25¢, S.P.

Parking costs 35¢ for the first hour and 25¢ for each additional hour. A part of an hour counts as a whole hour. Find the cost of parking from —

24. 9:15 A.M. till 10:45 A.M.
25. 8:55 A.M. till 10:45 A.M.
26. 11:15 A.M. till 1:30 P.M.

The amount of the sales and the rate of commission are given. Find the amount of commission.

27. \$16, sales; 5%, rate
28. \$20, sales; 6%, rate
29. \$32, sales; $6\frac{1}{4}\%$, rate
30. \$24, sales; $12\frac{1}{2}\%$, rate

The length of a board and the cost per linear foot are given. Find the total cost of the board.

31. 12 ft. @ 5¢ a foot
32. 8 ft. @ $7\frac{1}{2}$¢ a foot
33. 14 ft. @ 8¢ a foot
34. 12 ft. @ 15¢ a foot

Review Test II A

PART I. ARITHMETICAL TERMS

With a drawing, a definition, or an example, show that you know the meaning of each term below.

1. acute
2. altitude
3. angle
4. annual
5. arc
6. area
7. bar graph
8. base of a parallelogram
9. base of a triangle
10. circle graph
11. circumference
12. compasses
13. diameter
14. degree (°)
15. discount
16. hexagon
17. horizontal
18. interest
19. parallel
20. parallelogram
21. per cent (%)
22. perimeter
23. principal
24. protractor
25. quart
26. radius
27. rate
28. rectangle
29. rectangular
30. right angle
31. semicircle
32. vertical
33. volume
34. ratio

PART II. SKILLS

568	405	7892	2222

Multiply each number above by the following.

1.	10	20	70	90
2.	100	300	500	800
3.	1000	4000	6000	7000

840	906	2500	8002

Multiply each number above by the following.

4.	302	450	548	789
5.	427	618	903	4230

Change each fraction to a per cent and each per cent to a fraction in lowest terms.

6.	$\frac{1}{2}$	25%	$\frac{3}{4}$	$33\frac{1}{3}\%$	$\frac{2}{3}$
7.	30%	$\frac{7}{10}$	40%	$\frac{4}{5}$	$16\frac{2}{3}\%$
8.	$\frac{5}{6}$	$12\frac{1}{2}\%$	$\frac{3}{8}$	$62\frac{1}{2}\%$	$\frac{7}{8}$

9. Find the interest on \$750 at 6% for 1 yr. For 3 mo. For $2\frac{1}{4}$ yr.

10. Divide 8 ft. 4 in. by 5.

11. Multiply 3 lb. 12 oz. by 6.

12. Find 13% of 200; 120% of 16.

13. 18 is what per cent of 30?

14. Draw a circle with a radius of $2\frac{1}{4}$ inches.

Review Test II B

PART I. ADDITION

1. $287.62 + 57.93 + 109.77 ; $8\frac{5}{6} + 3\frac{1}{3} + 4\frac{1}{2}$; $267 + 98 + 580 + 903 + 79 + 6$

2. $7.863 + .047 + 9.156$; $1\frac{1}{6} + 2\frac{3}{4}$

3. 79; 138; 537; 93; 570

4. $.89; $15.25; $8.40; $3.58

5. .370; .057; 9.005; .588

6. $7\frac{1}{2}$; $14\frac{3}{8}$; $3\frac{1}{4}$; $6\frac{2}{3}$; $4\frac{5}{6}$

7. $3\frac{2}{5}$; 15; $2\frac{1}{2}$; $8\frac{7}{10}$

PART II. SUBTRACTION

1. $832 - 457$; $702 - 255$; $\$12.25 - 6.08$

2. $432 - 67$; $905 - 9$; $\$20.00 - 1.43$

3. $190.5 - 66.6$; $235 - 18\frac{1}{2}$; $23\frac{1}{3} - 7\frac{3}{4}$

PART III. MULTIPLICATION

1. 809×6 ; 720×30 ; 640×75

2. 865×302 ; 576×250 ; $\$.85 \times 8$

3. $4 \times 346\frac{1}{2}$; $64 \times 12\frac{3}{4}$

4. $57.09 \times .6$; $3\frac{3}{4} \times 1\frac{3}{5}$

PART IV. DIVISION

1. $8\overline{)4072}$; $6\overline{)2222}$

2. $30\overline{)2460}$; $32\overline{)2848}$

3. $89\overline{)17978}$; $34\overline{)2278}$

4. $20.44 \div 7.3$; $14.4 \div .18$

5. $156 \div 4\frac{1}{3}$; $18\frac{3}{4} \div 7\frac{1}{2}$

PART V. FRACTIONS, DECIMALS, AND PER CENTS

Change to decimals.

1. $\frac{3}{5}$ $\frac{1}{4}$ $\frac{7}{8}$ $\frac{3}{20}$ $\frac{1}{10}$

2. 4% 10% 25% 30% 37.5%

Change to fractions in lowest terms.

3. .75 .625 .85 $.66\frac{2}{3}$ .875

4. .05 $.18\frac{3}{4}$ .4 .005 $.06\frac{1}{4}$

5. $12\frac{1}{2}\%$ 7.5% $6\frac{1}{4}\%$ 80% $16\frac{2}{3}\%$

6. $33\frac{1}{3}\%$ $37\frac{1}{2}\%$ $8\frac{1}{3}\%$ 25% $18\frac{3}{4}\%$

$2.40	$16.80	$72	$960

7. Find 5% of each number above.

8. Find $6\frac{1}{4}\%$ of each number above.

9. Find $6\frac{2}{3}\%$ of each number above.

10. Find $8\frac{1}{3}\%$ of each number above.

Review Test II C

1. A rectangle is $4\frac{7}{8}$ in. long and $3\frac{1}{4}$ in. wide. What is the perimeter? The area?

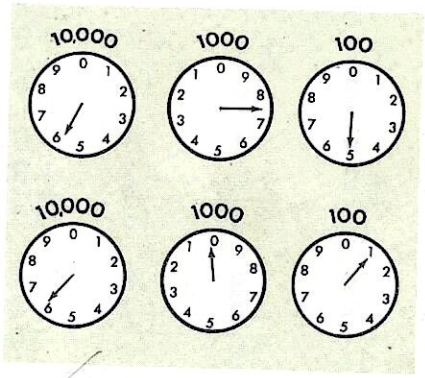
2. The diameter of a circle is 21 in. What is the radius? The circumference?

3. The scale of a map is given as 1 in. = 24 mi. The map distance between two towns is $2\frac{3}{8}$ in. What is the actual distance between the two towns?

4. The base of a triangle is 5.4 in. The altitude is 3.6 in. What is the area?

5. An electric company charges 5¢ per KWH for the first 20 KWH, 3.75¢ per KWH for the next 20 KWH, and 2.25¢ per KWH for the next 160 KWH. What is the cost of 36 KWH? Of 72 KWH?

6. According to the meters below, how many CCF of gas were used during the period?



7. The Sanders family used 3600 cu. ft. of water. What was the cost of the water at 9¢ per 100 cubic feet?

8. How many KWH of electricity are used by a 1250W ironer in 2 hr.? In $3\frac{1}{2}$ hr.?

9. A family uses 40% of its income for food, 15% for clothes, 25% for shelter, and 20% for other expenses. To show these facts in a circle graph, how many degrees will be in each of the four angles at the center of the graph?

10. A picture of an elephant is 2 in. high. The scale with the picture is $\frac{1}{60}$. What is the actual height in feet of the elephant?

11. The regular price of a tennis racket is $6.75. A sports club bought it at a discount of 12%. How much did the sports club have to pay?

12. Air is a mixture of gases. About 78% is nitrogen and about 21% is oxygen. About what per cent of the air is made up of other gases?

13. In a school election, 420 pupils voted. This was 75% of the total enrollment. How many pupils were enrolled in the school?

The Basic Addition Facts

0	0	0	0	0	0	0	0	0	0
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
1	2	3	4	5	6	7	8	9	10
2	2	2	2	2	2	2	2	2	2
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
2	3	4	5	6	7	8	9	10	11
3	3	3	3	3	3	3	3	3	3
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
3	4	5	6	7	8	9	10	11	12
4	4	4	4	4	4	4	4	4	4
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
4	5	6	7	8	9	10	11	12	13
5	5	5	5	5	5	5	5	5	5
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
5	6	7	8	9	10	11	12	13	14
6	6	6	6	6	6	6	6	6	6
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
6	7	8	9	10	11	12	13	14	15
7	7	7	7	7	7	7	7	7	7
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
7	8	9	10	11	12	13	14	15	16
8	8	8	8	8	8	8	8	8	8
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
8	9	10	11	12	13	14	15	16	17
9	9	9	9	9	9	9	9	9	9
+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
9	10	11	12	13	14	15	16	17	18

The Basic Subtraction Facts

$\begin{array}{r} 0 \\ -0 \\ \hline 0 \end{array}$	$\begin{array}{r} 1 \\ -0 \\ \hline 1 \end{array}$	$\begin{array}{r} 2 \\ -0 \\ \hline 2 \end{array}$	$\begin{array}{r} 3 \\ -0 \\ \hline 3 \end{array}$	$\begin{array}{r} 4 \\ -0 \\ \hline 4 \end{array}$	$\begin{array}{r} 5 \\ -0 \\ \hline 5 \end{array}$	$\begin{array}{r} 6 \\ -0 \\ \hline 6 \end{array}$	$\begin{array}{r} 7 \\ -0 \\ \hline 7 \end{array}$	$\begin{array}{r} 8 \\ -0 \\ \hline 8 \end{array}$	$\begin{array}{r} 9 \\ -0 \\ \hline 9 \end{array}$
$\begin{array}{r} 1 \\ -1 \\ \hline 0 \end{array}$	$\begin{array}{r} 2 \\ -1 \\ \hline 1 \end{array}$	$\begin{array}{r} 3 \\ -1 \\ \hline 2 \end{array}$	$\begin{array}{r} 4 \\ -1 \\ \hline 3 \end{array}$	$\begin{array}{r} 5 \\ -1 \\ \hline 4 \end{array}$	$\begin{array}{r} 6 \\ -1 \\ \hline 5 \end{array}$	$\begin{array}{r} 7 \\ -1 \\ \hline 6 \end{array}$	$\begin{array}{r} 8 \\ -1 \\ \hline 7 \end{array}$	$\begin{array}{r} 9 \\ -1 \\ \hline 8 \end{array}$	$\begin{array}{r} 10 \\ -1 \\ \hline 9 \end{array}$
$\begin{array}{r} 2 \\ -2 \\ \hline 0 \end{array}$	$\begin{array}{r} 3 \\ -2 \\ \hline 1 \end{array}$	$\begin{array}{r} 4 \\ -2 \\ \hline 2 \end{array}$	$\begin{array}{r} 5 \\ -2 \\ \hline 3 \end{array}$	$\begin{array}{r} 6 \\ -2 \\ \hline 4 \end{array}$	$\begin{array}{r} 7 \\ -2 \\ \hline 5 \end{array}$	$\begin{array}{r} 8 \\ -2 \\ \hline 6 \end{array}$	$\begin{array}{r} 9 \\ -2 \\ \hline 7 \end{array}$	$\begin{array}{r} 10 \\ -2 \\ \hline 8 \end{array}$	$\begin{array}{r} 11 \\ -2 \\ \hline 9 \end{array}$
$\begin{array}{r} 3 \\ -3 \\ \hline 0 \end{array}$	$\begin{array}{r} 4 \\ -3 \\ \hline 1 \end{array}$	$\begin{array}{r} 5 \\ -3 \\ \hline 2 \end{array}$	$\begin{array}{r} 6 \\ -3 \\ \hline 3 \end{array}$	$\begin{array}{r} 7 \\ -3 \\ \hline 4 \end{array}$	$\begin{array}{r} 8 \\ -3 \\ \hline 5 \end{array}$	$\begin{array}{r} 9 \\ -3 \\ \hline 6 \end{array}$	$\begin{array}{r} 10 \\ -3 \\ \hline 7 \end{array}$	$\begin{array}{r} 11 \\ -3 \\ \hline 8 \end{array}$	$\begin{array}{r} 12 \\ -3 \\ \hline 9 \end{array}$
$\begin{array}{r} 4 \\ -4 \\ \hline 0 \end{array}$	$\begin{array}{r} 5 \\ -4 \\ \hline 1 \end{array}$	$\begin{array}{r} 6 \\ -4 \\ \hline 2 \end{array}$	$\begin{array}{r} 7 \\ -4 \\ \hline 3 \end{array}$	$\begin{array}{r} 8 \\ -4 \\ \hline 4 \end{array}$	$\begin{array}{r} 9 \\ -4 \\ \hline 5 \end{array}$	$\begin{array}{r} 10 \\ -4 \\ \hline 6 \end{array}$	$\begin{array}{r} 11 \\ -4 \\ \hline 7 \end{array}$	$\begin{array}{r} 12 \\ -4 \\ \hline 8 \end{array}$	$\begin{array}{r} 13 \\ -4 \\ \hline 9 \end{array}$
$\begin{array}{r} 5 \\ -5 \\ \hline 0 \end{array}$	$\begin{array}{r} 6 \\ -5 \\ \hline 1 \end{array}$	$\begin{array}{r} 7 \\ -5 \\ \hline 2 \end{array}$	$\begin{array}{r} 8 \\ -5 \\ \hline 3 \end{array}$	$\begin{array}{r} 9 \\ -5 \\ \hline 4 \end{array}$	$\begin{array}{r} 10 \\ -5 \\ \hline 5 \end{array}$	$\begin{array}{r} 11 \\ -5 \\ \hline 6 \end{array}$	$\begin{array}{r} 12 \\ -5 \\ \hline 7 \end{array}$	$\begin{array}{r} 13 \\ -5 \\ \hline 8 \end{array}$	$\begin{array}{r} 14 \\ -5 \\ \hline 9 \end{array}$
$\begin{array}{r} 6 \\ -6 \\ \hline 0 \end{array}$	$\begin{array}{r} 7 \\ -6 \\ \hline 1 \end{array}$	$\begin{array}{r} 8 \\ -6 \\ \hline 2 \end{array}$	$\begin{array}{r} 9 \\ -6 \\ \hline 3 \end{array}$	$\begin{array}{r} 10 \\ -6 \\ \hline 4 \end{array}$	$\begin{array}{r} 11 \\ -6 \\ \hline 5 \end{array}$	$\begin{array}{r} 12 \\ -6 \\ \hline 6 \end{array}$	$\begin{array}{r} 13 \\ -6 \\ \hline 7 \end{array}$	$\begin{array}{r} 14 \\ -6 \\ \hline 8 \end{array}$	$\begin{array}{r} 15 \\ -6 \\ \hline 9 \end{array}$
$\begin{array}{r} 7 \\ -7 \\ \hline 0 \end{array}$	$\begin{array}{r} 8 \\ -7 \\ \hline 1 \end{array}$	$\begin{array}{r} 9 \\ -7 \\ \hline 2 \end{array}$	$\begin{array}{r} 10 \\ -7 \\ \hline 3 \end{array}$	$\begin{array}{r} 11 \\ -7 \\ \hline 4 \end{array}$	$\begin{array}{r} 12 \\ -7 \\ \hline 5 \end{array}$	$\begin{array}{r} 13 \\ -7 \\ \hline 6 \end{array}$	$\begin{array}{r} 14 \\ -7 \\ \hline 7 \end{array}$	$\begin{array}{r} 15 \\ -7 \\ \hline 8 \end{array}$	$\begin{array}{r} 16 \\ -7 \\ \hline 9 \end{array}$
$\begin{array}{r} 8 \\ -8 \\ \hline 0 \end{array}$	$\begin{array}{r} 9 \\ -8 \\ \hline 1 \end{array}$	$\begin{array}{r} 10 \\ -8 \\ \hline 2 \end{array}$	$\begin{array}{r} 11 \\ -8 \\ \hline 3 \end{array}$	$\begin{array}{r} 12 \\ -8 \\ \hline 4 \end{array}$	$\begin{array}{r} 13 \\ -8 \\ \hline 5 \end{array}$	$\begin{array}{r} 14 \\ -8 \\ \hline 6 \end{array}$	$\begin{array}{r} 15 \\ -8 \\ \hline 7 \end{array}$	$\begin{array}{r} 16 \\ -8 \\ \hline 8 \end{array}$	$\begin{array}{r} 17 \\ -8 \\ \hline 9 \end{array}$
$\begin{array}{r} 9 \\ -9 \\ \hline 0 \end{array}$	$\begin{array}{r} 10 \\ -9 \\ \hline 1 \end{array}$	$\begin{array}{r} 11 \\ -9 \\ \hline 2 \end{array}$	$\begin{array}{r} 12 \\ -9 \\ \hline 3 \end{array}$	$\begin{array}{r} 13 \\ -9 \\ \hline 4 \end{array}$	$\begin{array}{r} 14 \\ -9 \\ \hline 5 \end{array}$	$\begin{array}{r} 15 \\ -9 \\ \hline 6 \end{array}$	$\begin{array}{r} 16 \\ -9 \\ \hline 7 \end{array}$	$\begin{array}{r} 17 \\ -9 \\ \hline 8 \end{array}$	$\begin{array}{r} 18 \\ -9 \\ \hline 9 \end{array}$

The Basic Multiplication Facts

0	1	2	3	4	5	6	7	8	9
×0	×0	×0	×0	×0	×0	×0	×0	×0	×0
0	0	0	0	0	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9
×1	×1	×1	×1	×1	×1	×1	×1	×1	×1
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
×2	×2	×2	×2	×2	×2	×2	×2	×2	×2
0	2	4	6	8	10	12	14	16	18
0	1	2	3	4	5	6	7	8	9
×3	×3	×3	×3	×3	×3	×3	×3	×3	×3
0	3	6	9	12	15	18	21	24	27
0	1	2	3	4	5	6	7	8	9
×4	×4	×4	×4	×4	×4	×4	×4	×4	×4
0	4	8	12	16	20	24	28	32	36
0	1	2	3	4	5	6	7	8	9
×5	×5	×5	×5	×5	×5	×5	×5	×5	×5
0	5	10	15	20	25	30	35	40	45
0	1	2	3	4	5	6	7	8	9
×6	×6	×6	×6	×6	×6	×6	×6	×6	×6
0	6	12	18	24	30	36	42	48	54
0	1	2	3	4	5	6	7	8	9
×7	×7	×7	×7	×7	×7	×7	×7	×7	×7
0	7	14	21	28	35	42	49	56	63
0	1	2	3	4	5	6	7	8	9
×8	×8	×8	×8	×8	×8	×8	×8	×8	×8
0	8	16	24	32	40	48	56	64	72
0	1	2	3	4	5	6	7	8	9
×9	×9	×9	×9	×9	×9	×9	×9	×9	×9
0	9	18	27	36	45	54	63	72	81

The Basic Division Facts

$1\overline{)0}$	$2\overline{)0}$	$3\overline{)0}$	$4\overline{)0}$	$5\overline{)0}$	$6\overline{)0}$	$7\overline{)0}$	$8\overline{)0}$	$9\overline{)0}$
$1\overline{)1}$	$2\overline{)2}$	$3\overline{)3}$	$4\overline{)4}$	$5\overline{)5}$	$6\overline{)6}$	$7\overline{)7}$	$8\overline{)8}$	$9\overline{)9}$
$1\overline{)2}$	$2\overline{)4}$	$3\overline{)6}$	$4\overline{)8}$	$5\overline{)10}$	$6\overline{)12}$	$7\overline{)14}$	$8\overline{)16}$	$9\overline{)18}$
$1\overline{)3}$	$2\overline{)6}$	$3\overline{)9}$	$4\overline{)12}$	$5\overline{)15}$	$6\overline{)18}$	$7\overline{)21}$	$8\overline{)24}$	$9\overline{)27}$
$1\overline{)4}$	$2\overline{)8}$	$3\overline{)12}$	$4\overline{)16}$	$5\overline{)20}$	$6\overline{)24}$	$7\overline{)28}$	$8\overline{)32}$	$9\overline{)36}$
$1\overline{)5}$	$2\overline{)10}$	$3\overline{)15}$	$4\overline{)20}$	$5\overline{)25}$	$6\overline{)30}$	$7\overline{)35}$	$8\overline{)40}$	$9\overline{)45}$
$1\overline{)6}$	$2\overline{)12}$	$3\overline{)18}$	$4\overline{)24}$	$5\overline{)30}$	$6\overline{)36}$	$7\overline{)42}$	$8\overline{)48}$	$9\overline{)54}$
$1\overline{)7}$	$2\overline{)14}$	$3\overline{)21}$	$4\overline{)28}$	$5\overline{)35}$	$6\overline{)42}$	$7\overline{)49}$	$8\overline{)56}$	$9\overline{)63}$
$1\overline{)8}$	$2\overline{)16}$	$3\overline{)24}$	$4\overline{)32}$	$5\overline{)40}$	$6\overline{)48}$	$7\overline{)56}$	$8\overline{)64}$	$9\overline{)72}$
$1\overline{)9}$	$2\overline{)18}$	$3\overline{)27}$	$4\overline{)36}$	$5\overline{)45}$	$6\overline{)54}$	$7\overline{)63}$	$8\overline{)72}$	$9\overline{)81}$

Addition Practice

SET I

1.	4	3	5	8	9
	2	5	3	7	8
	+5	+4	+6	+9	+6
2.	4	2	1	6	8
	3	5	6	7	5
	2	4	5	8	9
	+5	+4	+4	+6	+8
3.	5	3	2	9	8
	4	3	6	9	5
	3	6	4	8	6
	2	1	5	7	8
	+1	+4	+3	+8	+9
4.	3	6	2	8	7
	5	5	6	9	8
	4	3	5	6	6
	3	2	1	7	9
	1	5	6	6	7
	+4	+2	+5	+9	+8

SET II

5.	279	467	359	894
	+315	+282	+587	+89
6.	562	766	874	109
	+193	+340	+109	+674
7.	28	9	68	300
	+320	+548	+443	+92
8.	34	28	546	300
	546	7	28	56
	+46	+439	+490	+178

SET III

9.	8	86	379	8559
	4	47	497	3886
	6	75	938	8962
	+9	+98	+778	+5876
10.	5	93	667	506
	9	8	39	6619
	4	74	430	98
	+7	+9	+8	+887
11.	9	47	386	1756
	6	38	764	9978
	5	65	349	6681
	6	76	998	7046
	+3	+19	+919	+1894
12.	7	28	605	5001
	7	36	240	667
	8	93	795	1875
	5	47	556	1024
	7	85	438	89
	+8	+16	+303	+6005

SET IV

13.	43807	29808	74937
	+16099	+93987	+24830
14.	5392	14159	948376
	+69381	+26381	+8004
15.	56783	35407	113611
	+85428	+82009	+578095
16.	40007	87201	141890
	+43056	+29939	+873091

Subtraction Practice

SET I

1.	574 − 248	396 − 129	894 − 255	6935 − 2471
2.	896 − 185	793 − 146	892 − 232	4690 − 1850
3.	347 − 196	418 − 232	938 − 476	5264 − 3951
4.	819 − 572	679 − 183	321 − 164	8976 − 2586
5.	631 − 357	692 − 296	458 − 169	7931 − 6971
6.	865 − 249	385 − 138	756 − 284	8642 − 3715

SET II

7.	763 − 175	760 − 279	832 − 370	9374 − 3186
8.	961 − 583	251 − 105	547 − 195	6453 − 1575
9.	476 − 209	872 − 229	683 − 493	7724 − 2759
10.	897 − 259	386 − 187	941 − 356	5762 − 1469
11.	495 − 237	873 − 584	561 − 375	5438 − 1992
12.	429 − 350	706 − 594	470 − 461	2107 − 1905

SET III

13.	800 − 709	805 − 796	514 − 429	4300 − 2109
14.	706 − 650	834 − 39	609 − 572	8700 − 4978
15.	100 − 97	790 − 679	710 − 615	3090 − 2473
16.	600 − 590	504 − 388	218 − 29	7005 − 3173
17.	147 − 92	165 − 71	138 − 80	6000 − 694
18.	159 − 65	592 − 263	287 − 38	8060 − 4508

SET IV

19.	831 − 237	645 − 209	946 − 872	1874 − 986
20.	800 − 349	590 − 194	603 − 385	6108 − 3199
21.	811 − 188	641 − 299	888 − 309	4209 − 2119
22.	439 − 291	806 − 418	500 − 187	6901 − 4444
23.	230 − 187	438 − 391	902 − 899	8943 − 4944
24.	938 − 9	862 − 779	660 − 401	5000 − 1796

Multiplication Practice

SET I

1.	42 ×4	81 ×6	27 ×9	482 ×6
2.	41 ×9	63 ×3	56 ×7	347 ×8
3.	21 ×5	81 ×7	89 ×6	673 ×9
4.	50 ×5	61 ×7	38 ×7	654 ×8
5.	82 ×4	60 ×9	78 ×8	437 ×9
6.	51 ×8	71 ×8	49 ×4	563 ×7

SET II

7.	52 ×4	72 ×3	28 ×6	397 ×7
8.	60 ×7	83 ×2	48 ×6	384 ×9
9.	94 ×8	68 ×7	28 ×9	393 ×6
10.	68 ×7	14 ×8	56 ×9	799 ×6
11.	85 ×50	64 ×30	93 ×40	576 ×90
12.	45 ×20	85 ×80	76 ×50	923 ×70

SET III

13.	35 ×91	75 ×42	59 ×37	630 ×70
14.	81 ×64	69 ×43	73 ×38	859 ×79
15.	63 ×37	39 ×46	72 ×88	856 ×54
16.	94 ×66	73 ×28	74 ×93	326 ×96
17.	372 ×47	825 ×68	946 ×35	873 ×41
18.	919 ×52	874 ×47	365 ×68	872 ×35

SET IV

19.	370 ×40	460 ×37	880 ×50	540 ×25
20.	630 ×506	578 ×305	907 ×207	750 ×608
21.	882 ×505	690 ×721	400 ×983	321 ×29
22.	894 ×300	783 ×911	259 ×412	989 ×111
23.	933 ×258	507 ×170	111 ×795	499 ×406
24.	583 ×29	309 ×607	710 ×520	377 ×988

Division Practice

SET I

1.	$7\overline{)357}$	$4\overline{)248}$	$6\overline{)246}$
2.	$3\overline{)126}$	$7\overline{)217}$	$6\overline{)486}$
3.	$8\overline{)728}$	$4\overline{)208}$	$6\overline{)126}$
4.	$8\overline{)568}$	$9\overline{)549}$	$8\overline{)648}$
5.	$5\overline{)355}$	$8\overline{)248}$	$2\overline{)184}$

SET II

6.	$4\overline{)360}$	$6\overline{)1806}$	$8\overline{)5608}$
7.	$4\overline{)3208}$	$7\overline{)4200}$	$4\overline{)1628}$
8.	$9\overline{)5463}$	$8\overline{)4032}$	$6\overline{)5454}$
9.	$8\overline{)7264}$	$3\overline{)272}$	$7\overline{)3546}$
10.	$6\overline{)4324}$	$8\overline{)5360}$	$9\overline{)6391}$

SET III

11.	$30\overline{)180}$	$40\overline{)120}$	$60\overline{)420}$
12.	$80\overline{)560}$	$50\overline{)350}$	$90\overline{)630}$
13.	$70\overline{)280}$	$40\overline{)360}$	$60\overline{)480}$
14.	$70\overline{)490}$	$20\overline{)480}$	$30\overline{)750}$
15.	$40\overline{)840}$	$20\overline{)780}$	$30\overline{)510}$

SET IV

16.	$32\overline{)198}$	$83\overline{)7885}$	$93\overline{)5859}$
17.	$43\overline{)172}$	$52\overline{)3128}$	$41\overline{)3813}$
18.	$92\overline{)579}$	$71\overline{)4473}$	$22\overline{)1188}$
19.	$82\overline{)738}$	$82\overline{)5166}$	$33\overline{)2673}$
20.	$43\overline{)387}$	$23\overline{)1173}$	$83\overline{)6972}$

SET V

21.	$35\overline{)875}$	$45\overline{)3222}$	$98\overline{)7010}$
22.	$23\overline{)989}$	$72\overline{)3460}$	$83\overline{)7974}$
23.	$61\overline{)458}$	$54\overline{)2229}$	$61\overline{)4398}$
24.	$21\overline{)945}$	$48\overline{)2998}$	$56\overline{)3498}$
25.	$32\overline{)544}$	$27\overline{)1694}$	$39\overline{)2438}$

SET VI

26.	$13\overline{)952}$	$18\overline{)1476}$	$14\overline{)7930}$
27.	$15\overline{)387}$	$18\overline{)1404}$	$19\overline{)1235}$
28.	$18\overline{)942}$	$16\overline{)9000}$	$19\overline{)6584}$
29.	$13\overline{)988}$	$17\overline{)9186}$	$14\overline{)3094}$
30.	$18\overline{)765}$	$19\overline{)9697}$	$16\overline{)9680}$

Whole Numbers: Mixed Practice

Do what the signs tell you to do.

SET I

1.	268 +315	449 +148	558 +239	656 +236
2.	473 −148	681 −434	571 −342	944 −229
3.	886 ×7	495 ×6	631 ×9	427 ×8
4.	$7\overline{)462}$	$8\overline{)216}$	$9\overline{)252}$	

SET II

5.	590 +142	175 +354	449 +160	430 +273
6.	571 −119	955 −283	682 −157	836 −444
7.	792 ×8	591 ×9	273 ×4	412 ×6
8.	$6\overline{)246}$	$8\overline{)672}$	$7\overline{)532}$	

SET III

9.	63 464 76 +114	738 516 39 +47	9144 382 64 +1138	475 1125 86 +847
10.	225 −78	118 −57	308 −63	331 −45

11.	192 ×50	348 ×70	767 ×40	231 ×60
12.	$8\overline{)690}$	$6\overline{)312}$	$9\overline{)684}$	

SET IV

13.	679 611 125 507 990 +731	576 848 498 157 485 +210	449 506 986 928 718 +223	522 269 920 852 474 +530
14.	583 −419	326 −146	4386 −1749	8403 −2672
15.	23 ×44	34 ×32	45 ×56	61 ×15
16.	$32\overline{)1312}$	$52\overline{)2410}$	$83\overline{)2241}$	

SET V

17.	$42\overline{)3822}$	$46\overline{)2346}$	$87\overline{)2349}$
18.	$87\overline{)5307}$	$75\overline{)2625}$	$59\overline{)1348}$
19.	$93\overline{)1209}$	$67\overline{)2881}$	$71\overline{)6248}$
20.	$66\overline{)1716}$	$89\overline{)1869}$	$34\overline{)3160}$
21.	$89\overline{)2325}$	$88\overline{)6248}$	$96\overline{)5236}$
22.	$42\overline{)1685}$	$29\overline{)8135}$	$82\overline{)4700}$
23.	$91\overline{)4002}$	$78\overline{)4106}$	$55\overline{)8013}$

Whole Numbers: Mixed Practice

Do what the signs tell you to do.

SET I

1.	208	396	400	109
	785	692	793	796
	395	749	786	973
	882	875	952	589
	667	487	449	669
	764	993	695	388
	+598	+476	+549	+276
2.	382	700	128	8638
	−246	−197	−99	−2442
3.	248	638	723	992
	×92	×27	×84	×13

4. $63\overline{)2652}$ $79\overline{)4878}$ $85\overline{)3910}$

SET II

5.	43	287	6	324
	302	80	740	4006
	421	29	300	999
	307	8	209	605
	430	406	407	160
	10	28	80	34
	+800	+304	+163	+900
6.	501	700	900	2001
	−424	−248	−304	−125
7.	425	504	420	400
	×230	×620	×510	×370

8. $7\overline{)2147}$ $9\overline{)2721}$ $8\overline{)4060}$

SET III

9.	248	9	643	70
	80	816	567	9020
	473	82	602	9
	80	198	89	143
	731	600	67	789
	9	47	133	6897
	+84	+5	+15	+17
10.	204	543	333	270
	−185	−8	−27	−259
11.	235	150	304	200
	×908	×607	×706	×809

12. $23\overline{)11569}$ $79\overline{)23858}$ $47\overline{)9588}$

SET IV

13.	474	285	591	434
	795	752	780	876
	381	890	708	200
	710	907	372	789
	714	925	699	102
	+603	+370	+473	+619
14.	604	560	804	900
	−338	−371	−208	−399
15.	906	805	401	809
	×705	×510	×902	×409
16.	420	600	904	800
	×305	×809	×509	×507

17. $25\overline{)6700}$ $33\overline{)5006}$ $48\overline{)8060}$

18. $89\overline{)1007}$ $72\overline{)6730}$ $16\overline{)8004}$

Work with Fractions

SET I

1. Copy each proper fraction from the rows below.

$\frac{3}{4}$ $\frac{6}{5}$ $\frac{7}{6}$ $\frac{8}{3}$ $\frac{4}{5}$ $\frac{2}{5}$

$\frac{1}{2}$ $\frac{4}{4}$ $\frac{3}{2}$ $\frac{6}{6}$ $\frac{8}{5}$ $\frac{2}{3}$

2. Copy each improper fraction from the rows above.

A proper fraction is in simplest form when it is in lowest terms.

To get an improper fraction in simplest form, change it to a whole number or mixed number with fraction part in lowest terms.

Change these fractions to simplest form.

3. $\frac{6}{8}$ $\frac{9}{12}$ $\frac{12}{4}$ $\frac{15}{6}$ $\frac{8}{5}$ $\frac{5}{4}$

4. $\frac{6}{4}$ $\frac{8}{10}$ $\frac{18}{4}$ $\frac{8}{6}$ $\frac{12}{8}$ $\frac{4}{6}$

5. $\frac{9}{6}$ $\frac{24}{8}$ $\frac{10}{6}$ $\frac{24}{9}$ $\frac{9}{4}$ $\frac{15}{8}$

6. $\frac{5}{3}$ $\frac{4}{4}$ $\frac{10}{3}$ $\frac{12}{12}$ $\frac{3}{9}$ $\frac{16}{12}$

SET II

Copy. Write the missing numerators.

7. $\frac{1}{4}=\frac{?}{8}$ $\frac{2}{3}=\frac{?}{6}$ $\frac{3}{4}=\frac{?}{8}$

8. $\frac{1}{3}=\frac{?}{12}$ $\frac{1}{4}=\frac{?}{12}$ $\frac{3}{4}=\frac{?}{12}$

9. $\frac{2}{3}=\frac{?}{12}$ $\frac{2}{3}=\frac{?}{24}$ $\frac{3}{4}=\frac{?}{24}$

10. $\frac{2}{5}=\frac{?}{10}$ $\frac{3}{5}=\frac{?}{15}$ $\frac{4}{5}=\frac{?}{20}$

11. $\frac{1}{6}=\frac{?}{12}$ $\frac{5}{6}=\frac{?}{12}$ $\frac{5}{6}=\frac{?}{24}$

12. $\frac{1}{8}=\frac{?}{16}$ $\frac{3}{8}=\frac{?}{24}$ $\frac{5}{8}=\frac{?}{16}$

13. $\frac{7}{8}=\frac{?}{24}$ $\frac{1}{8}=\frac{?}{24}$ $\frac{3}{8}=\frac{?}{16}$

14. $\frac{4}{9}=\frac{?}{36}$ $\frac{5}{6}=\frac{?}{36}$ $\frac{3}{4}=\frac{?}{36}$

SET III

Find the least common denominator for each set of fractions.

15. $\frac{1}{2}, \frac{3}{4}, \frac{7}{8}$ $\frac{7}{8}, \frac{3}{4}, \frac{2}{3}, \frac{1}{2}$

16. $\frac{3}{4}, \frac{5}{6}, \frac{1}{3}$ $\frac{5}{6}, \frac{1}{4}, \frac{3}{8}, \frac{1}{3}$

17. $\frac{1}{2}, \frac{1}{3}, \frac{5}{6}$ $\frac{3}{5}, \frac{1}{2}, \frac{2}{3}, \frac{1}{6}$

18. $\frac{3}{4}, \frac{5}{6}, \frac{1}{2}$ $\frac{1}{6}, \frac{1}{4}, \frac{4}{12}, \frac{2}{3}$

19. $\frac{1}{5}, \frac{1}{2}, \frac{3}{10}$ $\frac{4}{9}, \frac{3}{4}, \frac{5}{6}, \frac{2}{3}$

20. $\frac{3}{5}, \frac{1}{3}, \frac{4}{15}$ $\frac{2}{3}, \frac{3}{4}, \frac{5}{8}, \frac{5}{12}$

21. $\frac{7}{8}, \frac{2}{3}, \frac{1}{4}$ $\frac{3}{8}, \frac{1}{3}, \frac{3}{4}, \frac{5}{6}$

22. $\frac{2}{9}, \frac{3}{4}, \frac{5}{6}$ $\frac{1}{6}, \frac{3}{4}, \frac{5}{8}, \frac{1}{3}$

SET IV

Copy. Write the missing numerators.

23. $18\frac{1}{4}=17\frac{?}{4}$ $24\frac{1}{6}=23\frac{?}{6}$

24. $12\frac{1}{2}=11\frac{?}{4}$ $23\frac{1}{3}=22\frac{?}{6}$

25. $47\frac{3}{5}=46\frac{?}{5}$ $92\frac{5}{8}=91\frac{?}{8}$

26. $89\frac{2}{3}=88\frac{?}{6}$ $50\frac{3}{4}=49\frac{?}{8}$

27. $8\frac{1}{3}=7\frac{?}{12}$ $6\frac{2}{3}=5\frac{?}{12}$

28. $6\frac{1}{4}=5\frac{?}{12}$ $7\frac{3}{4}=6\frac{?}{12}$

29. $5\frac{5}{8}=4\frac{?}{24}$ $9\frac{3}{5}=8\frac{?}{15}$

30. $7=6\frac{?}{8}$ $3\frac{2}{5}=2\frac{?}{10}$

31. $41\frac{1}{4}=40\frac{?}{4}$ $9\frac{3}{8}=9\frac{?}{24}$

32. $10\frac{5}{16}=9\frac{?}{16}$ $12\frac{9}{10}=12\frac{?}{30}$

Addition of Fractions and Mixed Numbers

Find each sum in simplest form.

SET I

1.	$\frac{7}{8}$	$\frac{5}{6}$	$9\frac{5}{8}$	$32\frac{1}{6}$
	$\frac{4}{8}$	$\frac{1}{6}$	$3\frac{7}{8}$	$46\frac{2}{6}$
2.	$\frac{2}{6}$	$\frac{3}{4}$	$2\frac{3}{12}$	$43\frac{1}{8}$
	$\frac{3}{6}$	$\frac{2}{4}$	$5\frac{7}{12}$	$60\frac{2}{8}$
	$\frac{4}{6}$	$\frac{3}{4}$	$7\frac{4}{12}$	$67\frac{5}{8}$
3.	$\frac{1}{8}$	$\frac{1}{6}$	$5\frac{9}{12}$	$69\frac{5}{6}$
	$\frac{3}{8}$	$\frac{3}{6}$	$9\frac{7}{12}$	$7\frac{2}{6}$
	$\frac{5}{8}$	$\frac{5}{6}$	$8\frac{5}{12}$	$83\frac{1}{6}$
4.	$\frac{3}{5}$	$\frac{5}{9}$	$9\frac{7}{16}$	$90\frac{5}{8}$
	$\frac{1}{5}$	$\frac{3}{9}$	$\frac{5}{16}$	$65\frac{3}{8}$
	$\frac{4}{5}$	$\frac{4}{9}$	$8\frac{4}{16}$	7

SET II

5.	$\frac{7}{8}$	$\frac{9}{16}$	$8\frac{9}{10}$	$7\frac{9}{15}$
	$\frac{3}{8}$	$\frac{9}{16}$	$6\frac{6}{10}$	$9\frac{7}{15}$
	$\frac{2}{8}$	$\frac{6}{16}$	$3\frac{3}{10}$	$8\frac{4}{15}$
6.	$\frac{4}{8}$	$\frac{5}{6}$	$3\frac{4}{6}$	$9\frac{5}{12}$
	$\frac{7}{8}$	$\frac{5}{6}$	$8\frac{5}{6}$	$8\frac{8}{12}$
	$\frac{6}{8}$	$\frac{5}{6}$	$7\frac{2}{6}$	$4\frac{3}{12}$
7.	$\frac{1}{4}$	$\frac{7}{12}$	$8\frac{9}{16}$	$6\frac{9}{12}$
	$\frac{1}{4}$	$\frac{7}{12}$	$7\frac{7}{16}$	$\frac{5}{12}$
	$\frac{3}{4}$	$\frac{7}{12}$	$5\frac{8}{16}$	$7\frac{7}{12}$
8.	$\frac{1}{4}$	$\frac{1}{6}$	$8\frac{1}{5}$	$7\frac{2}{9}$
	$\frac{3}{4}$	$\frac{5}{6}$	$\frac{3}{5}$	$\frac{6}{9}$
	$\frac{3}{4}$	$\frac{5}{6}$	$3\frac{4}{5}$	$8\frac{4}{9}$

SET III

9.	$\frac{1}{2}$	$\frac{1}{2}$	$2\frac{1}{4}$	$16\frac{2}{3}$
	$\frac{1}{4}$	$\frac{3}{8}$	$4\frac{5}{8}$	$42\frac{1}{6}$
10.	$\frac{1}{3}$	$\frac{1}{6}$	$7\frac{1}{2}$	$45\frac{3}{8}$
	$\frac{1}{6}$	$\frac{1}{2}$	$3\frac{1}{4}$	$9\frac{3}{4}$
11.	$\frac{5}{8}$	$\frac{7}{12}$	$2\frac{7}{8}$	$64\frac{1}{3}$
	$\frac{1}{2}$	$\frac{2}{3}$	$5\frac{3}{8}$	$10\frac{5}{6}$
12.	$\frac{3}{5}$	$\frac{5}{12}$	$3\frac{1}{3}$	$75\frac{1}{2}$
	$\frac{7}{10}$	$\frac{3}{4}$	$6\frac{1}{2}$	$19\frac{2}{3}$
	$\frac{1}{2}$	$\frac{2}{3}$	$4\frac{1}{6}$	$20\frac{5}{6}$

SET IV

13.	$\frac{3}{4}$	$\frac{1}{4}$	$6\frac{2}{5}$	$65\frac{3}{8}$
	$\frac{1}{6}$	$\frac{2}{3}$	$7\frac{1}{2}$	$10\frac{1}{3}$
14.	$\frac{1}{4}$	$\frac{2}{3}$	$9\frac{7}{8}$	$62\frac{1}{5}$
	$\frac{4}{9}$	$\frac{1}{2}$	$\frac{5}{6}$	$7\frac{2}{3}$
15.	$\frac{3}{8}$	$\frac{4}{5}$	$6\frac{1}{2}$	$91\frac{7}{12}$
	$\frac{2}{3}$	$\frac{1}{2}$	$7\frac{3}{5}$	$17\frac{5}{12}$
16.	$\frac{5}{12}$	$\frac{5}{6}$	$8\frac{1}{3}$	$36\frac{5}{8}$
	$\frac{3}{8}$	$\frac{1}{4}$	$9\frac{3}{4}$	$75\frac{5}{6}$

SET V

17.	$\frac{4}{5}$	$\frac{7}{10}$	$6\frac{1}{7}$	$12\frac{2}{3}$
	$\frac{2}{7}$	$\frac{3}{4}$	$4\frac{1}{5}$	$16\frac{1}{8}$
18.	$\frac{2}{3}$	$\frac{3}{5}$	$3\frac{2}{9}$	$28\frac{5}{16}$
	$\frac{1}{2}$	$\frac{1}{4}$	$7\frac{1}{2}$	$7\frac{3}{8}$
	$\frac{3}{4}$	$\frac{1}{2}$	$6\frac{1}{4}$	$11\frac{1}{2}$
	$\frac{5}{6}$	$\frac{5}{8}$	$1\frac{5}{6}$	$16\frac{3}{4}$

Subtraction of Fractions and Mixed Numbers

Find each remainder in simplest form.

SET I

1.	$\frac{5}{6} - \frac{1}{6}$	$\frac{7}{8} - \frac{3}{8}$	$1\frac{1}{3} - \frac{2}{3}$	$21\frac{1}{4} - \frac{3}{4}$
2.	$\frac{5}{12} - \frac{2}{12}$	$\frac{9}{16} - \frac{5}{16}$	$7\frac{1}{6} - 1\frac{5}{6}$	$62\frac{1}{5} - 23\frac{4}{5}$
3.	$\frac{2}{3} - \frac{1}{6}$	$\frac{3}{4} - \frac{1}{8}$	$9\frac{1}{4} - 3\frac{7}{8}$	$43\frac{1}{6} - 22\frac{1}{3}$
4.	$\frac{3}{4} - \frac{1}{2}$	$\frac{7}{9} - \frac{1}{3}$	$4\frac{1}{2} - \frac{3}{4}$	$63\frac{3}{4} - 8\frac{1}{8}$

SET II

5.	$3\frac{1}{3} - 1\frac{2}{3}$	$6\frac{1}{4} - 2\frac{3}{4}$	$5\frac{1}{6} - 1\frac{5}{6}$	$4\frac{1}{5} - 1\frac{3}{5}$
6.	$6\frac{1}{8} - 1\frac{3}{8}$	$4\frac{1}{4} - \frac{3}{4}$	$7\frac{2}{6} - 5\frac{3}{6}$	$8\frac{3}{5} - \frac{4}{5}$
7.	$6\frac{3}{8} - 2\frac{7}{8}$	$4\frac{1}{6} - 3\frac{5}{6}$	$3\frac{1}{8} - 1\frac{3}{8}$	$5\frac{3}{8} - 4\frac{5}{8}$
8.	$6\frac{2}{5} - 4\frac{3}{5}$	$8\frac{2}{4} - 5\frac{3}{4}$	$7\frac{3}{8} - 1\frac{5}{8}$	$9\frac{2}{6} - 4\frac{5}{6}$

SET III

9.	$6\frac{1}{4} - 2\frac{1}{2}$	$8\frac{1}{3} - 3\frac{5}{6}$	$7\frac{1}{2} - 6\frac{3}{4}$	$4\frac{1}{6} - 3\frac{1}{3}$
10.	$6\frac{1}{2} - 2\frac{5}{8}$	$4\frac{1}{8} - 2\frac{1}{4}$	$8\frac{3}{8} - 7\frac{1}{2}$	$9\frac{1}{4} - 3\frac{7}{8}$
11.	$7\frac{1}{5} - 2\frac{3}{5}$	$9\frac{3}{8} - 2\frac{3}{4}$	$8\frac{2}{5} - 7\frac{4}{5}$	$5\frac{1}{3} - 2\frac{5}{6}$
12.	$8\frac{1}{8} - \frac{3}{4}$	$7\frac{3}{5} - \frac{4}{5}$	$4\frac{1}{4} - 3\frac{1}{2}$	$5\frac{1}{3} - 4\frac{3}{6}$

SET IV

13.	$8\frac{1}{3} - 2\frac{1}{4}$	$6\frac{3}{8} - 1\frac{2}{3}$	$7\frac{1}{2} - 2\frac{5}{6}$	$4\frac{1}{3} - 2\frac{3}{5}$
14.	$7\frac{1}{2} - 2\frac{3}{5}$	$9\frac{1}{4} - 3\frac{2}{5}$	$8\frac{1}{3} - 7\frac{3}{4}$	$7\frac{1}{2} - \frac{2}{3}$
15.	$8\frac{1}{4} - 6\frac{2}{3}$	$9\frac{1}{5} - 8\frac{3}{4}$	$2\frac{1}{3} - \frac{7}{8}$	$3\frac{2}{5} - \frac{7}{8}$
16.	$8\frac{3}{5} - 1\frac{7}{8}$	$6\frac{1}{3} - 5\frac{5}{8}$	$9\frac{2}{5} - 3\frac{3}{4}$	$7\frac{1}{4} - 6\frac{2}{3}$

SET V

17.	$7\frac{3}{8} - 2\frac{2}{3}$	$8\frac{5}{12} - 3\frac{3}{4}$	$9\frac{1}{8} - 7\frac{2}{5}$	$6\frac{1}{6} - 5\frac{1}{2}$
18.	$8\frac{1}{3} - 6\frac{5}{6}$	$7\frac{1}{2} - 6\frac{2}{3}$	$4\frac{1}{8} - \frac{7}{8}$	$5\frac{1}{5} - \frac{5}{6}$
19.	$7\frac{1}{4} - 5\frac{1}{3}$	$8\frac{5}{6} - 3\frac{7}{8}$	$9\frac{5}{12} - \frac{3}{4}$	$7\frac{3}{8} - 6\frac{2}{3}$
20.	$6\frac{1}{4} - 2\frac{3}{5}$	$4\frac{1}{12} - 2\frac{1}{16}$	$7\frac{5}{12} - 3\frac{9}{16}$	$3\frac{7}{12} - 2\frac{7}{16}$
21.	$8 - 5\frac{2}{3}$	$5\frac{7}{8} - 3\frac{2}{3}$	$4\frac{1}{8} - 3\frac{1}{5}$	$9\frac{7}{8} - 9\frac{7}{16}$

Multiplication of Fractions and Mixed Numbers

Cancel when you can. Find each product in simplest form.

SET I

1.	$\frac{1}{2}\times 3$	$\frac{1}{3}\times 5$	$\frac{1}{4}\times 7$
2.	$\frac{1}{5}\times 9$	$\frac{2}{3}\times 4$	$\frac{3}{4}\times 5$
3.	$\frac{2}{5}\times 3$	$\frac{3}{8}\times 5$	$\frac{1}{2}\times 6$
4.	$\frac{1}{3}\times 12$	$\frac{1}{4}\times 8$	$\frac{1}{8}\times 24$
5.	$\frac{2}{3}\times 15$	$\frac{3}{4}\times 16$	$\frac{5}{6}\times 12$

SET II

6.	$5\times\frac{1}{4}$	$7\times\frac{1}{3}$	$9\times\frac{1}{2}$
7.	$15\times\frac{1}{8}$	$5\times\frac{5}{6}$	$9\times\frac{3}{8}$
8.	$8\times\frac{2}{3}$	$7\times\frac{3}{4}$	$12\times\frac{1}{4}$
9.	$21\times\frac{1}{3}$	$10\times\frac{1}{2}$	$18\times\frac{1}{6}$
10.	$24\times\frac{3}{4}$	$24\times\frac{7}{8}$	$24\times\frac{5}{6}$

SET III

11.	$\frac{1}{2}\times 2\frac{1}{2}$	$\frac{1}{4}\times 3\frac{1}{3}$	$\frac{1}{3}\times 7\frac{1}{2}$
12.	$\frac{1}{5}\times 8\frac{1}{3}$	$5\frac{1}{3}\times\frac{1}{8}$	$4\frac{4}{5}\times\frac{1}{6}$
13.	$6\frac{2}{3}\times\frac{1}{4}$	$3\frac{3}{4}\times\frac{1}{12}$	$\frac{2}{3}\times 2\frac{1}{4}$
14.	$\frac{3}{4}\times 5\frac{1}{3}$	$\frac{5}{6}\times 3\frac{3}{5}$	$\frac{5}{8}\times 5\frac{1}{3}$
15.	$2\frac{2}{3}\times\frac{3}{8}$	$1\frac{1}{3}\times\frac{5}{12}$	$13\frac{1}{3}\times\frac{7}{8}$

SET IV

16.	$1\frac{1}{2}\times 5$	$8\frac{1}{3}\times 4$	$3\frac{3}{4}\times 3$
17.	$6\frac{2}{3}\times 5$	$7\times 3\frac{1}{3}$	$5\times 6\frac{1}{4}$
18.	$4\times 4\frac{2}{3}$	$3\frac{1}{2}\times 4$	$8\frac{3}{4}\times 8$
19.	$8\frac{1}{3}\times 6$	$6\frac{2}{3}\times 12$	$8\times 6\frac{1}{4}$
20.	$9\times 3\frac{1}{3}$	$12\times 3\frac{3}{4}$	$16\times 7\frac{1}{2}$

SET V

21.	$1\frac{3}{4}\times 1\frac{1}{3}$	$3\frac{1}{2}\times 3\frac{1}{3}$	$8\frac{1}{3}\times 1\frac{1}{5}$
22.	$6\frac{2}{3}\times 1\frac{1}{2}$	$3\frac{1}{7}\times 4\frac{2}{3}$	$1\frac{5}{6}\times 7\frac{1}{2}$
23.	$6\frac{3}{4}\times 6\frac{2}{3}$	$3\frac{1}{3}\times 6\frac{1}{4}$	$1\frac{7}{8}\times 3\frac{1}{3}$
24.	$3\frac{1}{3}\times 3\frac{3}{4}$	$1\frac{1}{2}\times 3\frac{1}{2}$	$1\frac{2}{3}\times 4\frac{1}{5}$
25.	$1\frac{3}{4}\times 2\frac{1}{2}$	$5\frac{1}{4}\times 3\frac{1}{7}$	$2\frac{1}{4}\times 1\frac{2}{3}$

SET VI

26.	$225\times 3\frac{1}{5}$	$237\frac{1}{2}\times 4$	$416\frac{2}{3}\times 6$
27.	$750\times 6\frac{2}{3}$	$224\times 3\frac{1}{7}$	$620\frac{3}{4}\times 8$
28.	$672\times 3\frac{1}{7}$	$756\frac{3}{8}\times 8$	$263\frac{1}{3}\times 21$
29.	$504\frac{5}{6}\times 36$	$924\frac{3}{8}\times 32$	$838\frac{3}{5}\times 25$

SET VII

30.	$560\times 26\frac{3}{4}$	$924\times 48\frac{2}{3}$	$784\times 40\frac{3}{16}$
31.	$720\times 72\frac{5}{6}$	$579\times 24\frac{3}{4}$	$936\frac{1}{2}\times 25$
32.	$338\times 33\frac{1}{3}$	$742\frac{7}{8}\times 44$	$312\frac{1}{2}\times 47$
33.	$764\frac{3}{8}\times 36$	$664\times 24\frac{1}{6}$	$806\times 38\frac{1}{4}$
34.	$507\frac{1}{8}\times 15$	$699\frac{2}{3}\times 25$	$400\times 17\frac{4}{7}$

Division with Fractions: Thinking

1. Mrs. Gray bought 12 lb. of powdered sugar in 2-pound boxes. How many boxes did she buy?

2. Mrs. Gray bought 16 oz. of yellow plums. Each plum weighed about $\frac{1}{2}$ oz. How many plums did she get?

Tony picked up two plums at a time and put them in the bag. For each 2 plums, he counted 1 ounce: 1, 2, 3, . . . to 16. This made 16 oz. in all.

What is the weight of the plums that Tony picks up at one time? How many times does he pick up plums to make a total weight of 16 oz.?

How many plums does Tony pick up at one time? How many times does he pick up plums? How many plums does he pick up in all?

THINK: 16 oz. $\div \frac{1}{2}$ oz. = ? (plums)

Cut about 35 small squares from cardboard. Write $\frac{1}{2}$ oz. on each square. Use the squares as plums in acting out problem 2.

THINK: $16 \div \frac{1}{2} = 16 \times \frac{2}{1} = ?$

3. Mrs. Gray bought 16 oz. of green plums. Each plum weighed $\frac{2}{3}$ oz. Tony picked up 3 plums at a time and put them in the bag. What is the weight of 3 green plums?

For each 3 plums, Tony counts 2 ounces: 2, 4, 6, . . . to 16. How many times does Tony pick up plums? How many does he pick up each time? How many does he pick up in all?

THINK: $16 \div \frac{2}{3} = 16 \times \frac{3}{2} = ?$

Make cardboard squares to act out problem 3.

4. Each blue plum weighs $\frac{3}{4}$ oz. Mrs. Gray bought 24 oz. How many blue plums did she get?

Tony picked up 4 plums at a time. He counted 3 ounces for each 4 plums: 3, 6, 9, . . . to 24.

What weight of plums did Tony pick up each time? What total weight did he pick up? How many times did he have to pick up plums?

How many plums did Tony pick up each time? How many did he pick up in all?

Make cardboard squares to act out problem 4.

THINK: $24 \div \frac{3}{4} = 24 \times \frac{4}{3} = ?$

5. Each purple plum weighs $\frac{7}{8}$ oz. Mrs. Gray bought 28 oz. How many plums are needed to make 7 oz.? To make 28 oz.?

6. How many $\frac{3}{8}$-pound peaches will make 12 lb.?

7. A cardboard rectangle is 6 in. by 12 in. How many squares $\frac{3}{4}$ in. on a side are in one row along

the length of the rectangle? How many squares $\frac{3}{4}$ in. on a side are across one end of the rectangle?

8. A floor is a rectangle 12 ft. by 15 ft. It is to be covered with square tiles $\frac{2}{3}$ ft. on a side. How many tiles are needed for one row along the length of the floor? How many tiles are needed for a row across an end of the floor?

9. A girls' club bought 15 ft. of ribbon. They will cut it into pieces $\frac{3}{4}$ ft. long. How many pieces will they have? Prove your answer with a drawing.

10. Make up a problem to use each division below. Solve the problem. Prove each answer with a drawing.

$20 \div \frac{5}{8}$ $20 \div \frac{5}{6}$

Division with Fractions: Practice

SET I	SET II	SET III	SET IV
1. $3 \div \frac{1}{2}$	1. $\frac{2}{3} \div 4$	1. $4 \div 2\frac{1}{2}$	1. $\frac{3}{4} \div \frac{2}{3}$
2. $2 \div \frac{1}{4}$	2. $\frac{5}{8} \div 5$	2. $10 \div 1\frac{2}{3}$	2. $\frac{5}{6} \div \frac{5}{8}$
3. $4 \div \frac{1}{3}$	3. $\frac{1}{4} \div 2$	3. $5 \div 3\frac{1}{3}$	3. $\frac{3}{8} \div \frac{3}{4}$
4. $5 \div \frac{1}{8}$	4. $\frac{3}{4} \div 6$	4. $8 \div 1\frac{1}{3}$	4. $\frac{1}{3} \div \frac{1}{6}$
5. $1\frac{1}{2} \div \frac{1}{2}$	5. $\frac{3}{8} \div 3$	5. $15 \div 3\frac{3}{4}$	5. $\frac{2}{3} \div \frac{1}{6}$
6. $2\frac{1}{2} \div \frac{1}{4}$	6. $\frac{5}{6} \div 5$	6. $14 \div 1\frac{3}{4}$	6. $\frac{5}{6} \div \frac{2}{5}$
7. $3\frac{1}{3} \div \frac{1}{6}$	7. $\frac{3}{4} \div 9$	7. $20 \div 16\frac{2}{3}$	7. $\frac{7}{8} \div \frac{7}{12}$
8. $1\frac{3}{4} \div \frac{1}{8}$	8. $\frac{2}{3} \div 6$	8. $15 \div 1\frac{1}{2}$	8. $\frac{9}{16} \div \frac{3}{4}$
9. $12 \div \frac{3}{4}$	9. $1\frac{1}{2} \div 3$	9. $24 \div 2\frac{2}{3}$	9. $1\frac{1}{4} \div 2\frac{1}{2}$
10. $6 \div \frac{2}{3}$	10. $3\frac{1}{3} \div 5$	10. $36 \div 1\frac{1}{5}$	10. $16\frac{2}{3} \div 3\frac{1}{3}$
11. $15 \div \frac{5}{6}$	11. $1\frac{7}{8} \div 3$	11. $18 \div 1\frac{1}{2}$	11. $1\frac{7}{8} \div 1\frac{1}{4}$
12. $20 \div \frac{5}{8}$	12. $4\frac{2}{3} \div 4$	12. $30 \div 2\frac{1}{2}$	12. $5\frac{5}{6} \div 2\frac{2}{5}$
13. $1\frac{1}{2} \div \frac{2}{3}$	13. $2\frac{1}{4} \div 18$	13. $21 \div 3\frac{1}{3}$	13. $3\frac{1}{2} \div 1\frac{3}{4}$
14. $1\frac{1}{2} \div \frac{3}{4}$	14. $6\frac{2}{3} \div 4$	14. $35 \div 1\frac{3}{4}$	14. $1\frac{2}{3} \div 8\frac{1}{3}$
15. $6\frac{2}{3} \div \frac{1}{6}$	15. $5\frac{5}{8} \div \frac{1}{9}$	15. $72 \div 5\frac{1}{7}$	15. $8\frac{3}{4} \div 4\frac{3}{8}$

Fractions: Mixed Practice

Find each answer in simplest form.

SET I

1.	$\frac{3}{8}$ $\frac{3}{4}$ $\frac{1}{4}$ $\frac{7}{16}$ $+\frac{1}{2}$	$\frac{5}{6}$ $\frac{7}{8}$ $\frac{2}{3}$ $\frac{5}{12}$ $+\frac{3}{4}$	$3\frac{1}{2}$ $3\frac{1}{4}$ $5\frac{7}{8}$ $1\frac{2}{3}$ $+7\frac{5}{6}$	$36\frac{3}{4}$ $29\frac{1}{3}$ $48\frac{2}{9}$ $53\frac{5}{6}$ $+95\frac{2}{3}$
2.	$\frac{3}{4}$ $-\frac{1}{3}$	$\frac{5}{6}$ $-\frac{1}{4}$	$4\frac{1}{4}$ $-1\frac{7}{8}$	$52\frac{1}{3}$ $-28\frac{5}{6}$
3.	12 $\times 3\frac{1}{3}$	$18\frac{3}{4}$ $\times 6$	72 $\times 12\frac{1}{2}$	$54\frac{5}{6}$ $\times 15$
4.	$16\frac{2}{3} \div 4$	$48 \div 2\frac{2}{3}$	$17\frac{1}{2} \div 1\frac{1}{4}$	
5.	$60 \div \frac{5}{6}$	$\frac{7}{8} \div 2$	$\frac{5}{6} \div \frac{2}{3}$	

SET II

6.	$2\frac{2}{3}$ $2\frac{4}{5}$ $8\frac{7}{15}$ $4\frac{5}{6}$ $4\frac{1}{6}$ $+1\frac{7}{30}$	$3\frac{1}{2}$ $3\frac{1}{3}$ $8\frac{7}{15}$ $6\frac{3}{5}$ $6\frac{5}{6}$ $+7\frac{1}{5}$	$1\frac{1}{4}$ $2\frac{1}{3}$ $3\frac{7}{8}$ $2\frac{5}{6}$ $9\frac{11}{12}$ $+5\frac{3}{4}$	$16\frac{1}{4}$ $22\frac{2}{5}$ $13\frac{1}{2}$ $21\frac{3}{10}$ 10 $+11\frac{4}{5}$
7.	$2\frac{3}{8}$ $-\frac{1}{2}$	$8\frac{1}{3}$ $-\frac{3}{4}$	$7\frac{1}{4}$ $-6\frac{3}{4}$	$63\frac{2}{5}$ $-28\frac{1}{2}$
8.	$15 \times \frac{2}{3}$	$\frac{3}{4} \times 18$	$\frac{5}{6} \times \frac{2}{3}$	
9.	$1\frac{1}{4} \times 30$	$16 \times 1\frac{1}{3}$	$2\frac{1}{4} \times 3\frac{1}{2}$	
10.	$1\frac{7}{8} \div 1\frac{1}{2}$	$\frac{8}{15} \div 1\frac{2}{3}$	$2\frac{2}{3} \div 6$	
11.	$7\frac{1}{2} \div \frac{3}{4}$	$6\frac{1}{4} \div 1\frac{1}{2}$	$\frac{9}{10} \div 6$	

SET III

12.	$750 \div 2\frac{1}{2}$	$280 \div 3\frac{1}{3}$	$225 \div 7\frac{1}{2}$
13.	$175 \div 1\frac{7}{8}$	$682 \div 3\frac{1}{7}$	$150 \div 3\frac{3}{4}$
14.	$400 \div 6\frac{1}{4}$	$360 \div 16\frac{2}{3}$	$312 \div 1\frac{1}{5}$
15.	$312\frac{1}{2} \div 2$	$186\frac{3}{4} \div 3$	$266\frac{2}{3} \div 4$
16.	$313\frac{1}{5} \div 6$	$715\frac{1}{2} \div 6$	$310\frac{2}{3} \div 8$
17.	$287\frac{1}{4} \div 6$	$373\frac{1}{3} \div 9$	$584\frac{1}{4} \div 3$

Use the number in the box with each number in that row.

SET IV

18.	$8\frac{1}{3}$	$6\frac{1}{4}$	$13\frac{2}{3}$	$27\frac{1}{2}$	$+2\frac{5}{6}$
19.	$3\frac{1}{5}$	$8\frac{5}{6}$	$22\frac{3}{8}$	$84\frac{2}{3}$	$-2\frac{1}{2}$
20.	$7\frac{1}{2}$	$3\frac{5}{8}$	$24\frac{5}{6}$	$90\frac{2}{3}$	$\times 4$
21.	$2\frac{1}{4}$	$2\frac{5}{8}$	$18\frac{3}{4}$	$38\frac{2}{5}$	$\div \frac{3}{4}$

SET V

22.	$7\frac{2}{5}$	$6\frac{2}{3}$	$38\frac{7}{8}$	$13\frac{5}{6}$	$+\frac{3}{4}$
23.	$3\frac{1}{3}$	$2\frac{1}{4}$	$10\frac{3}{8}$	$24\frac{1}{6}$	$-\frac{7}{8}$
24.	$1\frac{7}{8}$	$2\frac{1}{4}$	$13\frac{3}{4}$	$43\frac{1}{2}$	$\times 1\frac{1}{3}$
25.	$2\frac{2}{5}$	$5\frac{1}{4}$	$25\frac{1}{2}$	$23\frac{1}{4}$	$\div \frac{3}{8}$

SET VI

26.	$2\frac{1}{2}$	$3\frac{1}{3}$	$17\frac{3}{4}$	$31\frac{5}{6}$	$+4\frac{5}{9}$
27.	$8\frac{1}{3}$	$7\frac{5}{6}$	$22\frac{1}{2}$	$56\frac{1}{8}$	$-3\frac{3}{4}$
28.	$7\frac{1}{3}$	$3\frac{1}{9}$	$16\frac{4}{5}$	78	$\times \frac{3}{8}$
29.	6	7	30	50	$\div 1\frac{3}{5}$
30.	$7\frac{1}{2}$	$4\frac{3}{4}$	$5\frac{5}{8}$	$2\frac{1}{10}$	$\div 2\frac{1}{4}$

Fractions and Decimals

SET I

Write with decimal points.

1.	$\frac{3}{10}$	$\frac{7}{100}$	$\frac{26}{100}$	$\frac{125}{1000}$
2.	$\frac{8}{10}$	$\frac{5}{100}$	$\frac{32}{100}$	$\frac{18}{1000}$
3.	$\frac{4}{10}$	$\frac{12}{100}$	$\frac{9}{1000}$	$\frac{105}{1000}$
4.	$\frac{7}{10}$	$\frac{4}{100}$	$\frac{82}{1000}$	$\frac{4}{1000}$

SET II

Write as common fractions in lowest terms.

5.	.75	.70	.10	.24
6.	.80	.20	.25	.60
7.	.08	.04	.05	.02
8.	.36	.40	.15	.50

SET III

Write as decimals.

9.	$\frac{3}{4}$	$\frac{3}{5}$	$\frac{1}{2}$	$\frac{16}{25}$
10.	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{1}{25}$	$\frac{24}{25}$
11.	$\frac{9}{50}$	$\frac{7}{20}$	$\frac{9}{20}$	$\frac{17}{20}$
12.	$\frac{7}{10}$	$\frac{3}{10}$	$\frac{3}{50}$	$\frac{19}{50}$

SET IV

Write as decimals, like this:

$$\frac{4}{15} = .26\frac{2}{3}$$

13.	$\frac{1}{3}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{15}$
14.	$\frac{1}{6}$	$\frac{5}{6}$	$\frac{1}{12}$	$\frac{5}{12}$
15.	$\frac{7}{8}$	$\frac{5}{8}$	$\frac{3}{16}$	$\frac{7}{40}$

SET V

Change to common fractions in lowest terms.

16.	$.12\frac{1}{2}$	$.08\frac{1}{3}$	$.66\frac{2}{3}$	$.03\frac{1}{3}$
17.	$.06\frac{1}{4}$	$.83\frac{1}{3}$	$.18\frac{3}{4}$	$.33\frac{1}{3}$
18.	$.02\frac{1}{2}$	$.13\frac{1}{3}$	$.16\frac{2}{3}$	$.62\frac{1}{2}$
19.	$.37\frac{1}{2}$	$.87\frac{1}{2}$	$.07\frac{1}{2}$	$.22\frac{1}{2}$
20.	$.14\frac{2}{7}$	$.22\frac{2}{9}$	$.91\frac{2}{3}$	$.42\frac{6}{7}$

SET VI

Change to decimals correct to the nearest hundredth.

21.	$\frac{4}{7}$	$\frac{5}{9}$	$\frac{7}{12}$	$\frac{13}{16}$
22.	$\frac{2}{3}$	$\frac{1}{9}$	$\frac{5}{12}$	$\frac{11}{18}$
23.	$\frac{2}{7}$	$\frac{8}{11}$	$\frac{7}{24}$	$\frac{13}{24}$
24.	$\frac{1}{13}$	$\frac{5}{13}$	$\frac{5}{32}$	$\frac{11}{36}$

SET VII

25. Multiply by 10.
    .04 3.2 15 2.005
26. Multiply by 100.
    .05 .65 1.8 .3456
27. Multiply by 1000.
    .03 .75 3.9 65.82
28. Multiply by .1.
    .09 8.3 .49 155.3
29. Multiply by .01.
    34.3 17.8 7.4 .37
30. Multiply by .001.
    243.5 46.2 7.5 .48

Adding and Subtracting Decimals

Do what the signs tell you to do.

SET I

1.	1.4 8.3 +6.2	32.5 16.0 +9.6	7.14 .62 +1.70	.673 1.460 +.805
2.	.85 .19 +.75	9.16 .89 +1.80	4.70 1.07 +.76	38.76 5.42 +11.46
3.	1.7 7.6 3.9 8.4 +6.0	7.4 29.7 8.0 6.3 +18.6	8.32 .98 6.70 .14 +9.32	8.601 .093 1.200 .436 +9.525
4.	.60 .41 .18 .38 .47 .09 +.93	.9 3.7 15.3 6.7 10.0 4.3 +.9	32.0 6.8 10.3 9.5 18.6 22.9 +.4	9.902 1.701 .006 .183 .175 .877 +6.249

SET II

5.	3.8 −1.7	67.1 −43.2	8.30 −7.54	4.714 −.805
6.	.83 −.36	9.10 −2.18	3.76 −.96	16.51 −3.75
7.	7.2 −.7	.90 −.09	30.2 −4.5	4.062 −1.875
8.	.44 −.07	5.7 −5.2	1.44 −.95	75.38 −8.88

SET III

9.	3.5+8.7+6.4	18.9−16.3
10.	7.8+6.9+8.7	10.5−9.46
11.	17.3+9.2+.8	7.38−4.50
12.	8.2+8.9+.6	6.38−2.64
13.	4.3+17.2+.7	29.7−7.38
14.	9.463+56.190	.125−.065
15.	62.38+9.53	.684−.495
16.	1.665+.904	87.6−59.8

SET IV

Change to decimals. Follow the signs.

17.	$1\frac{1}{2}+3\frac{3}{4}+1\frac{3}{8}$	$6\frac{1}{4}+\frac{7}{8}+3\frac{1}{2}$
18.	$\frac{4}{25}+7\frac{1}{8}+1\frac{1}{4}$	$4\frac{3}{5}+\frac{3}{4}+\frac{5}{8}$
19.	$22\frac{1}{2}-8\frac{3}{4}$	$17\frac{5}{8}-3\frac{1}{2}$
20.	$7\frac{3}{4}-\frac{5}{8}$	$125-1\frac{1}{4}$

SET V

Add.

21. $43.75; $8.40; $35.15; $.90
22. $65; $1.90; $240; $45.75; $8
23. $1.25; $.80; $4; 65¢; $10
24. $375; $3.75; $19; $.85; 5¢

Find the differences.

25.	$75−$18.75	$1.25−$.80
26.	$2−75¢	$.90−$.28
27.	$6.75−$2	$1.75−8¢

Multiplication of Decimals

SET I

1.	861.4 × 8	39.25 × 7	4.738 × 6	54.69 × 5
2.	317.6 × 10	28.93 × 20	5.792 × 40	9.863 × 60
3.	259.4 × 300	87.65 × 700	4.397 × 100	316.8 × 900
4.	729.8 × 6000	43.36 × 1000	8.972 × 7000	38.76 × 9000

SET II

5.	.6 × 20	.72 × 30	.325 × 300	.0412 × 70
6.	.8 × 32	.05 × 70	.046 × 80	.6734 × 800
7.	.7 × 9	.19 × 26	.009 × 260	.0008 × 4000
8.	.3 × 5	.36 × 93	.017 × 9	.0055 × 6

SET III

9.	7638 × 2.5	4817 × 3.8	5479 × .9	9117 × 8.6
10.	4328 × .36	6274 × 1.56	8976 × .08	5434 × 9.05
11.	8495 × .001	7739 × 1.75	6428 × .062	3774 × .609

SET IV

12.	6.125 × 4.8	84.63 × .28	9.187 × .4	400.9 × 8.4
13.	7.387 × 8.5	62.19 × 1.7	8.134 × 3.2	846.6 × .25
14.	6.718 × 3.6	54.03 × .09	67.76 × 6.5	184.0 × 3.8

SET V

15.	28 × .5	.36 × .9	4.93 × .15	18.38 × 32
16.	.9 × 47	6.7 × 2.4	8.05 × .64	727.5 × 3.6
17.	16.98 × 4.2	9.173 × 8.6	.6702 × 300	90.15 × 400

SET VI

18.	8063 × .05	4700 × .006	9000 × .8	6008 × 1.45
19.	4.650 × .72	82.19 × .04	473.9 × .6	767.5 × .4
20.	644.7 × 7.2	51.08 × .75	55.04 × 1000	7.007 × 200
21.	567.3 × 16	22.7 × 9	4.872 × 11	77.89 × 28
22.	265.3 × 9000	.0472 × 981	.2017 × 907	438.09 × 888

Dividing with Decimals

You may write the division $.6\overline{)1.2}$ in a fraction form: $\frac{1.2}{.6}$.

You may write the fraction $\frac{12}{6}$ as a division: $6\overline{)12}$.

SET I

Write in fraction form.

1. $.4\overline{)1.8}$ $1.5\overline{)4.5}$ $.12\overline{)7.2}$
2. $.7\overline{).63}$ $3.6\overline{)2.16}$ $.09\overline{)5.4}$

Write as divisions.

3. $\frac{3.2}{.4}$ $\frac{32}{4}$ $\frac{.56}{.7}$ $\frac{5.6}{7}$
4. $\frac{1.32}{.06}$ $\frac{.225}{.15}$ $\frac{132}{6}$ $\frac{22.5}{15}$

The value of a fraction is not changed if both denominator and numerator are multiplied by the same number. It is easy to multiply a number by 10, or 100, or 1000. Why?

$$\frac{.6}{.8}=\frac{.6\times10}{.8\times10}=\frac{6}{8}$$

A quotient is unchanged if both divisor and dividend are multiplied by the same number.

$$.8\overline{)1.6}=8\overline{)16}$$

SET II

Multiply each denominator by 10 or 100 or 1000 to make it a whole number. Multiply the numerator by the same number.

1. $\frac{2.8}{.7}$ $\frac{1.8}{.8}$ $\frac{.32}{.04}$ $\frac{.256}{.064}$
2. $\frac{7.2}{1.8}$ $\frac{54}{.9}$ $\frac{51.2}{1.28}$ $\frac{9.84}{.123}$

Multiply each divisor by 10 or 100 or 1000 to make it a whole number. Multiply the dividend by the same number.

3. $.6\overline{)2.4}$ $1.25\overline{).625}$ $.312\overline{).156}$
4. $1.5\overline{)6}$ $.12\overline{)1.56}$ $.072\overline{)5.32}$

SET III

Divide each number in a row by the number in the box. Check.

					.8
1.	3.2	.72	.112	240	.06
2.	.54	.09	2.04	37.2	1.5
3.	9	.75	.18	.435	.056
4.	2.8	.84	42	.035	

SET IV

Choose the sensible quotient from the numbers in parentheses. Explain why it is sensible.

1. $6.72 \div 3.2$ (21; 2.1; .21)
2. $30.96 \div .43$ (72; 7.2; .72)
3. $.984 \div .024$ (41; 4.1; .41)
4. $.288 \div .09$ (32; 3.2; .32)

Division with Decimals: Practice

Divide. Check by multiplying.

	SET I	SET II	SET III	SET IV
1.	$8\overline{)734.4}$	$4.6\overline{)15.64}$	$.011\overline{)1.045}$	$.5\overline{)148}$
2.	$10\overline{)78.63}$	$5.4\overline{).998}$	$.039\overline{).2181}$	$8.75\overline{)5.6}$
3.	$4\overline{).0952}$	$2.8\overline{)207.2}$	$.047\overline{)2.397}$	$.01\overline{)120}$
4.	$73\overline{)3.066}$	$1.9\overline{).1824}$	$.038\overline{).2774}$	$.004\overline{).024}$
5.	$2000\overline{)68}$	$.86\overline{)4.386}$	$.008\overline{)7.392}$	$.28\overline{)8.4}$
6.	$6\overline{).9342}$	$.62\overline{)40.92}$	$.003\overline{).8463}$	$.144\overline{)17.28}$
7.	$140\overline{)13.3}$	$.73\overline{)335.8}$	$.125\overline{)6.125}$	$.54\overline{)9720}$
8.	$300\overline{)542.1}$	$.27\overline{).2268}$	$.625\overline{).9225}$	$.008\overline{).0096}$
9.	$3\overline{).0078}$	$.7\overline{)64.54}$	$1.124\overline{)8.992}$	$.003\overline{).27}$
10.	$62\overline{)38.44}$	$.9\overline{)5.832}$	$2.132\overline{).8528}$	$.77\overline{)231}$
11.	$450\overline{)3.87}$	$.8\overline{).6024}$	$.004\overline{).0016}$	$.375\overline{)24}$
12.	$7\overline{)62.58}$	$.6\overline{)833.4}$	$.052\overline{).0104}$	$.002\overline{).06}$
13.	$51\overline{)418.2}$	$.04\overline{)61.72}$	$.144\overline{).0864}$	$.001\overline{)35}$
14.	$84\overline{).1848}$	$.08\overline{)1.776}$	$.026\overline{).0078}$	$.065\overline{)260}$

SET V

The quotient figures in all the divisions below are 125. Write the quotient for each division with the decimal point placed correctly. You will need to write 0's in some of the quotients.

1.	$6.25 \div 5$	$6.25 \div .5$	$62.5 \div .5$	$.625 \div .05$
2.	$7.5 \div .6$	$750 \div .6$	$.75 \div .6$	$.75 \div .06$
3.	$.5 \div .4$	$500 \div .4$	$5 \div .04$	$50 \div .4$
4.	$37.5 \div .3$	$3.75 \div 30$	$37.5 \div 3$	$.375 \div .03$

SET I

Lengths and widths of rectangles are given. Find the perimeter and the area of each.

	LENGTH	WIDTH
1.	6 in.	4 in.
2.	13 yd.	2 yd.
3.	85 mi.	8 mi.
4.	$2\frac{1}{2}$ ft.	$1\frac{1}{3}$ ft.
5.	$7\frac{1}{2}$ in.	$6\frac{1}{4}$ in.
6.	$5\frac{3}{8}$ mi.	$2\frac{1}{2}$ mi.
7.	3.2 in.	.9 in.
8.	8.6 ft.	2.3 ft.
9.	4.7 yd.	1.9 yd.

SET II

Altitudes and bases of triangles are given. Find the area of each.

	ALTITUDE	BASE
10.	3 in.	4 in.
11.	12 ft.	5 ft.
12.	8 yd.	15 yd.
13.	7 mi.	24 mi.
14.	$3\frac{3}{4}$ in.	5 in.
15.	$7\frac{1}{2}$ in.	$3\frac{1}{8}$ in.
16.	9.06 ft.	6.93 ft.
17.	16.16 yd.	20.07 yd.
18.	7.5 in.	6.25 in.

SET III

Each figure below represents the radius, diameter, or circumference of a circle. Where r or d is given, find c. Where c is given, find d and r.

19.	$r = 7$ in.	20.	$r = 2$ ft.
21.	$d = 21$ ft.	22.	$d = 3.2$ in.
23.	$c = 11$ in.	24.	$c = 88$ in.
25.	$r = 3\frac{1}{2}$ yd.	26.	$d = 35$ mi.
27.	$d = 1.75$ in.	28.	$r = 1.75$ in.
29.	$c = 38\frac{1}{2}$ ft.	30.	$r = 12$ in.

SET IV

Lengths, widths, and heights of rectangular solids are given below. Find the total area of the outside surfaces of each solid and the volume of each solid.

	LENGTH	WIDTH	HEIGHT
31.	17 in.	8 in.	15 in.
32.	12 in.	3 in.	6 in.
33.	4 ft.	3 ft.	1 ft.
34.	14 ft.	6 ft.	5 ft.
35.	$7\frac{1}{2}$ in.	$6\frac{1}{4}$ in.	4 in.
36.	$3\frac{3}{4}$ in.	2 in.	$2\frac{1}{2}$ in.
37.	9.8 ft.	3.6 ft.	10 ft.
38.	6.4 ft.	2.6 ft.	20 ft.
39.	7.2 in.	4 in.	2.5 in.

SET V

A rectangular garden is 18 ft. by 12 ft. A walk 3 ft. wide goes all the way around the garden.

40. What is the distance around the garden? Around the outside of the walk?

41. What is the area of the garden only? Of the garden and walk? Of the walk only?

42. The bases of a trapezoid are 14 in. and 8 in. The altitude is 4 in. Each of the equal sides is 5 in. Find the perimeter.

43. A circular garden is 14 ft. in diameter. A walk $3\frac{1}{2}$ ft. wide goes completely around the garden. What is the circumference of the garden? Of the outside of the walk?

44. A square table is 3 ft. on a side. A square napkin is 1 ft. on a side. How many napkins will cover the table completely without any overlapping?

45. A square table is 3 ft. on a side. A square napkin is 9 in. on a side. How many napkins will cover the table completely without any overlapping?

46. A room is 18′ by 24′. How many rugs 6′ by 9′ will cover the floor completely?

SET VI

47. Using the scale, $\frac{1}{8}$ in. = 1 mi., what actual distance is represented by $\frac{1}{2}$ in.? By $1\frac{1}{4}$ in.? By $3\frac{7}{8}$ in.? By 3 in.?

48. Using the scale, $\frac{1}{16}$ in. = 1 mi., what distance on the scale drawing will stand for 10 mi.? For 32 mi.? For 60 mi.? For 160 mi.?

49. Using the scale, $\frac{1}{4}$ in. = 10 ft., draw to scale a rectangle 75 ft. by 110 ft.

50. Using the scale, $\frac{1}{4}$ in. = 5 ft., draw to scale a circle with a radius of 25 ft.

51. A bicycle wheel is 28 in. in diameter. What is the circumference? How many times will the wheel turn in going 176 ft.?

52. A square garden is 4 ft. on a side. How many pansy plants are needed to cover the garden completely, with outside rows of pansies 3 in. from the edges of the garden? The plants are set 6 in. apart. A scale drawing may help you.

53. The perimeter of a square is 20 in. Find the length of a side. Find the area.

54. A rectangle is twice as long as it is wide. Its perimeter is 18 ft. Find the length. Find the area.

Percentage Problems

SET I

1. Mr. Jones owned 640 acres of land. He sold 25% of it. How many acres did he sell? How many acres did he have left?

2. There are 40 pupils in the seventh grade. 45% of them are boys. How many boys are in the seventh grade?

3. The price of a bicycle is reduced from $32 to $24. What per cent is the reduction of the original price?

4. Harry earns $250 a month. Tom earns 30% less than Harry. How much does Tom earn?

5. A shipment of milk contained 3.5% butterfat. How many pounds of butterfat are in 1600 lb. of this milk?

6. There were 48 pupils in a class. Six were on the honor roll. What per cent were on the honor roll?

7. The regular price of a scarf is $3. The sale price is $2.25. The reduction is what per cent of the regular price?

8. Milk is 87% water. How many pounds of water are in 1000 lb. of milk?

9. The Smiths spend 30% of their income for food. The income is $3000 a year. What is their average monthly expenditure for food?

10. The annual income of the Jones family is $3600. Their rent is $60 a month. What per cent of their annual income is spent for rent?

11. The yearly income of the Yates family is $3000. They use 20% of their income for rent. What is their monthly rent?

12. The price of apples was increased from $2.25 to $3 a bushel. The increase was what per cent of the original price?

13. Find the interest on $600 for 3 mo. at 4%.

14. A merchant sold a suit for $30. He made a profit of $7.50. What per cent of the selling price was the profit?

15. A merchant sold a knife for $2.50. His profit was 30% of the selling price. How much was the profit?

16. Mr. Dann sold a chair for $75. His gross profit was $30. What per cent is the gross profit of the selling price?

Percentage Problems

SET II

1. The marked price of a hat was $4.50. The price was reduced 20%. What was the reduced price?

2. The marked price of a table was $87.50. The margin was 40% of the marked price. What was the cost?

3. A salesman sold a used car for $850. His commission was 20% of the sale price. How much was his commission?

4. A merchant paid $36 for a suit. He sold it for $60. What per cent was the margin of the selling price?

5. The margin on tooth paste is 60% of the selling price. A tube of tooth paste cost the druggist 12¢. What should be the selling price?

6. A note for $500 was discounted at 6% for 30 days. What were the net proceeds?

7. How much money must be invested at $2\frac{1}{2}\%$ interest to give an income of $1000 a year?

8. A real estate company sold a house for $12,500. The rate of commission was 5%. How much was the commission?

9. Tom's rate of commission is 15%. He earns about $240 a month. What are his total sales for a month?

10. The regular price of a suit was $50. The sale price was $37.50. What was the per cent of the reduction?

11. The list price of a radio is $60. There are discounts of 25% and 20%. What is the net price?

12. A commission merchant sold 72 baskets of apples at $1.75 a basket. The rate of commission was 8%. Find the amount of the commission and the net proceeds.

13. Mrs. Hays bought linens at a "$33\frac{1}{3}\%$ Off" sale. She saved $12. What was the regular price of the linens she bought?

14. The list price of costume jewelry was $240. There were trade discounts of 50% and $12\frac{1}{2}\%$. What was the net price?

15. Mr. Ray has $7200 from the sale of his home after he paid a real estate salesman 4% for selling it. What was the selling price of the home?

16. Find 100%:

SET III

1. The price of bacon increased from 48¢ a pound to 96¢ a pound. What was the per cent of the increase?

2. Jack had 96¢ and spent 48¢ of it. What per cent of his money did he spend?

3. The weight of a pig increased from 200 lb. to 240 lb. What was the per cent of the increase?

4. Bob earned $18 a week. He got an increase of 25%. What were his increased wages?

5. Helen's wages were increased 20%. The increased wages were $18 a week. What were the former wages?

6. Jane's wages were decreased 30%. Her wages had been $25 a week. What were her decreased wages?

7. Dick's wages were decreased 15%. This made his wages $25.50 a week. What were his wages before they were decreased?

8. Sam's wages were increased from $20 to $25 a week. What was the per cent of the increase?

9. A farmer had 540 bu. of wheat last year. He has about 10% less this year. How many bushels does he have this year?

10. Mr. Mills has 450 bu. of potatoes. This is 50% more than last year. How many bushels did he have last year?

11. Mr. Ray has 450 bu. of apples. This is 100% more than last year. How many bushels did he have last year?

12. Mr. Nash has 450 bu. of peaches. This is $12\frac{1}{2}$% more than last year. How many bushels did he have last year?

13. Mr. Gray has 450 bu. of pears. This is 10% less than last year. How many bushels did he have last year?

14. Sue had $96. She spent $72 of it for clothes. What per cent of her money did she spend?

15. The regular price of a hat was $9.60. The sale price is $7.20. What is the per cent of the decrease?

16. The price of a coat was $7.20. It was increased to $9.60. What was the per cent of increase?

17. Find the sale price on a $5 hat which had been reduced 20%.

18. Find 25% of 144. Of 98.

Percentage Problems

SET IV

1. Mr. Vinson paid $24 interest on a loan of $600 for 1 yr. What was the rate?

2. A hat was sold for $5. This gave a margin of 50% of the selling price. What was the cost?

3. Mary has $6. Jane has 25% more than Mary. How much does Jane have?

4. A dealer sold a building lot for $1500. This was 250% of what he had paid for it. How much had he paid for it?

5. A dealer paid $18 for a table. The overhead was $6. He made a profit of $33\frac{1}{3}\%$ of the selling price. What was the selling price?

6. The list price of a chair is $45. There are discounts of 20% and $16\frac{2}{3}\%$. What is the net price?

7. The selling price of a hat was $12.50. This allowed for overhead of $3, and net profit of 30% of selling price. How much did the hat cost?

8. Glen paid $27.50 for a bicycle. He sold it for $33. How much did he gain? What per cent of the cost was the gain? What per cent of the selling price was the gain?

9. Jim Brown earns $32 a week. Mr. Brown earns 225% as much. How much does Mr. Brown earn a week?

10. George earned 75¢ an hour. He got an increase of 18%. How much did he earn then?

11. Of the 30 children in a class, 3 did not attend a picnic. What per cent attended the picnic?

12. A shoe company had 240 employees and hired 60 more. What was the per cent of the increase?

13. Helen sold 160 boxes of Christmas cards for 75¢ a box. Her rate of commission was 20%. What was the amount of her commission?

14. June is a salesgirl. She is paid $17.50 plus 4% commission on the amount of her sales. Last week her sales amounted to $465. How much did she earn in all?

15. Lucille saves $12\frac{1}{2}\%$ of her income. Last year she saved $175. What was her income?

16. Bill saves $16\frac{2}{3}\%$ of his income. His income last year was $1344. How much did he save?

17. What per cent is 18 of 300?

The pages of this book have helped you explore the regular work in arithmetic for your grade. These pages will help you explore further — to solve more difficult problems, to discover new ways of solving problems, and to learn additional useful skills and facts.

▶ A hundred years ago many pupils learned to check their multiplication by *dividing by nines.* It will be interesting and helpful for you to learn how to check this way. Study the multiplication and the check below.

MULTIPLICATION	CHECK
328	328 ÷ 9 = 36, r4 ↔ 4
×56	56 ÷ 9 = 6, r2 ↔ ×2
1968	8
1640	
18368	18368 ÷ 9 = 2040, r8

Follow these steps to check multiplication by dividing by nines.

- Divide the multiplicand by 9 and write the remainder.
- Divide the multiplier by 9 and write the remainder.
- Multiply the two remainders.
- Divide the product by 9 and write the remainder.
- Compare the product of the first two remainders with the third remainder. If the numbers are the same, the multiplication is correct.

Find remainders after dividing by nines.

1.	76	328	438	5634
2.	83	197	215	7878

Divide by nines to check.

3.	328	197	5634	7878
	×76	×83	×94	×236
4.	492	513	8262	1765
	×72	×83	×34	×63

5. What do you notice about each of the checks in number 4?

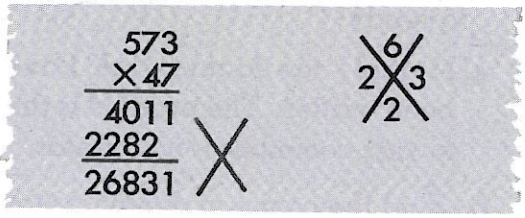
▶ Many pupils in Belgium and France check their examples with a shorter method, called *proof by nines* or *casting out nines.*

MULTIPLICATION		CHECK
328	3+2+8=13; 1+3=4	4
×56	5+6=11; 1+1=2	8 × 8
1968		2
1640		2×4=8
18368	1+8+3+6+8=26; 2+6=8	

To check multiplication with proof by nines, follow the steps at the top of the next page.

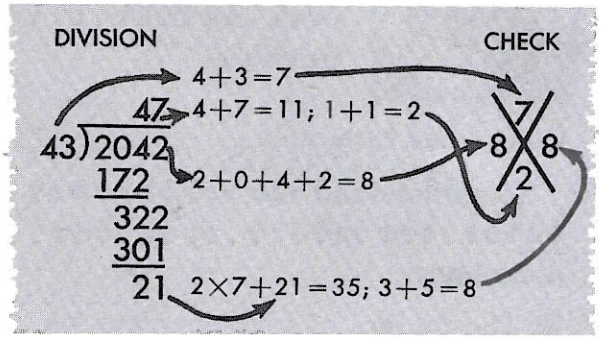
- Add the figures in the multiplicand (3+2+8=13). Add the figures in this sum (1+3=4). Write the sum (4) in the top of the X.
- Do the same with the multiplier (5+6=11; 1+1=2). Write the sum (2) in the bottom of the X.
- Do the same with the product (1+8+3+6+8=26; 2+6=8). Write the sum (8) in the left side of the X.
- Multiply the number in the top of the X by the number in the bottom of the X (2×4=8). Write the product in the right side of the X.
- Compare the numbers in the left and right sides of the X. If they are the same, the multiplication is correct.

6. Georgette, a French girl, did this multiplication and check. Find and correct her mistake.



7. Use proof by nines to check your multiplication in examples 3 and 4.

▶ Proof by nines can also be used to check division. Study the example and the explanation.



- Add 4 and 3 (figures in the divisor). Write 7 in the top of the X.
- Add 4 and 7 (figures in the quotient); add 1 and 1. Write 2 in the bottom of the X.
- Add 2, 0, 4, and 2 (figures in the dividend). Write 8 in the left side of the X.
- Multiply 2×7 and add 21 (remainder); add 3 and 5. Write 8 in right side of X.
- Compare numbers in the left and right sides of X. If they are the same, the division is correct.

Check with proof by nines.

8. $53\overline{)3964}$ $42\overline{)3987}$ $67\overline{)8017}$
9. $72\overline{)6743}$ $93\overline{)2356}$ $94\overline{)5678}$
10. $48\overline{)3269}$ $77\overline{)8902}$ $82\overline{)4987}$

In Unit Two you studied the work with fractions that most people find useful. These pages offer you a challenge to explore more difficult work in fractions. If you study this work carefully, it will increase your understanding of fractions.

Using Prime Factors

To understand the use of prime factors, you need to study three definitions.

■ **The factors of a number are its exact divisors.**

1. Which numbers can be divided exactly into 6? The factors of 6 are ? and ?.

2. Which numbers, when multiplied together, have 15 as a product? The factors of 15 are ? and ?.

3. Sometimes there is more than one set of factors. Which numbers can be divided exactly into 18? The factors of 18 are ? and ? or ? and ?.

■ **A prime number is a number that can be divided exactly only by itself and by 1.**

4. Which numbers below are prime numbers? Explain.

2 3 4 5 6 7 8 9 10 11

■ **The prime factors of a number are factors which are prime numbers.**

5. The prime factors of 18 are $2 \times 3 \times 3$. Explain why 6 is a factor, but not a prime factor, of 18. Why is 9 not a prime factor of 18?

▶ Finding prime factors will help you when you are looking for common denominators. Follow these steps to find a common denominator.

- Find the prime factors of each denominator.
- Write each prime factor at least once. If a prime factor occurs more than once in one or more denominators, write it as often as in the denominator in which it occurs most frequently.
- Multiply the factors that have been written. The product is the lowest common denominator.

6. Find the common denominator for $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{9}$, $\frac{3}{8}$, and $\frac{4}{15}$. Study and explain the work at the top of the next page.

Denominator	Prime Factors
4	2×2
6	2×3
9	3×3
8	$2\times2\times2$
15	3×5

Common Denominator:

$$3\times3\times2\times2\times2\times5=360$$

7. Test to see if 360 can be divided exactly by each of the denominators above.

Use prime factors to find common denominators. Find answers in simplest form.

8. $\frac{1}{7}+\frac{2}{13}+\frac{12}{91}$

9. $\frac{2}{5}+\frac{7}{23}+\frac{24}{115}$

10. $\frac{1}{4}+\frac{5}{6}+\frac{7}{17}+\frac{13}{51}$

11. $3\frac{2}{9}+11\frac{5}{6}+7\frac{14}{39}$

12. $\frac{13}{18}-\frac{7}{15}$ $\frac{19}{35}-\frac{17}{42}$ $\frac{41}{84}-\frac{19}{105}$

13. $\frac{11}{21}-\frac{9}{35}$ $\frac{17}{36}-\frac{7}{45}$ $\frac{59}{66}-\frac{67}{77}$

Using Reciprocals in Division of Fractions

You have learned that a quotient is not changed if both divisor and dividend are multiplied by the same number.

Explain and check.

1. The quotient of $6\div2$ is the same as the quotient of $18\div6$; of $30\div10$; of $48\div16$. By what number were both terms of $6\div2$ multiplied to get each of the other division questions?

2. In the example below, both the divisor and the dividend were multiplied by 2.

$$\frac{9}{4}\div\frac{3}{8}=\frac{9}{4}\times\frac{8}{3}\div\frac{3}{8}\times\frac{8}{3}=6\div1$$

$$\frac{\cancel{9}^{3}}{\cancel{4}_{1}}\times\frac{\cancel{8}^{2}}{\cancel{3}_{1}}=6;\quad\frac{\cancel{3}^{1}}{\cancel{8}_{1}}\times\frac{\cancel{8}^{1}}{\cancel{3}_{1}}=1$$

Explain why $\frac{9}{4}\div\frac{3}{8}$ is the same as $6\div1$.

Notice that both divisor and dividend were multiplied by $\frac{8}{3}$. The terms of the fraction $\frac{8}{3}$ are just the opposite of the terms of $\frac{3}{8}$, the divisor. Such a number is called a *reciprocal.* Two numbers are reciprocals when their product is 1.

Explain and check.

3. $\frac{5}{6}\div\frac{2}{3}=\frac{5}{6}\times\frac{3}{2}\div1=\frac{5}{6}\times\frac{3}{2}$

4. $6\div\frac{3}{4}=6\times\frac{4}{3}\div1=6\times\frac{4}{3}$

■ **The dividend times the reciprocal of the divisor is the quotient.**

Use the reciprocal method.

5. $\frac{3}{4}\div\frac{1}{3}$ $\frac{3}{8}\div\frac{1}{4}$ $\frac{5}{8}\div\frac{1}{2}$

6. $\frac{9}{16}\div\frac{3}{8}$ $\frac{5}{12}\div\frac{3}{4}$ $\frac{2}{3}\div\frac{4}{5}$

There are many measures in addition to those used in homes and in everyday business. On these pages you can learn about some of these measures.

▶ The smallest standard unit of our weight measure is the *grain*. It is said that originally it was taken as the weight of a grain of wheat. The weight of a grain is always the same.

1. The aspirin in an ordinary tablet weighs 5 grains. Try to find other examples of grains used as a measure of weight.

2. Our commonly-used weights are called *avoirdupois* weight. (See page 56.) An avoirdupois pound contains 7000 grains. How many grains are there in an avoirdupois ounce?

The English system of avoirdupois weight is different from ours. This is the table of English avoirdupois weight.

16 ounces = 1 pound
14 pounds = 1 stone
8 stone = 1 hundredweight
20 hundredweights = 1 ton

3. How many pounds are in a hundredweight in England?

4. How many pounds are in a ton in England?

Our ton of 2000 lb. is called a *short ton*. The English ton of 2240 lb. is called a *long ton*.

5. An aluminum plant imported 1000 long tons of ore. How many short tons was this?

▶ Persons who weigh gold and other precious metals use *troy* weight. This is the table.

24 grains = 1 pennyweight
20 pennyweights = 1 ounce
12 ounces = 1 troy pound

6. How many grains are in a troy ounce? In a troy pound?

▶ Persons who weigh drugs use *apothecaries'* weight. Strange signs are used for the different units of apothecaries' weight. You sometimes see these signs on doctors' prescriptions. This is the table.

20 grains = 1 scruple (℈)
3 scruples = dram (ʒ)
8 drams = 1 ounce (ʒ)
12 ounces = 1 pound (lb. or ℔)

7. A druggist is putting 2 scruples of a powder into 5-grain capsules. How many capsules will he have?

▶ The standard gallon in the United States is smaller than the English or *imperial* gallon. The imperial gallon is about $1\frac{1}{5}$ as large as the U. S. gallon.

8. The tank of an English automobile holds 15 imperial gallons of gasoline. How many U. S. gallons will it hold?

9. If an imperial gallon of gasoline costs 36¢, what is a fair cost for a U. S. gallon of the same quality gasoline?

▶ The bushel probably began as the amount of wheat a man could carry. This was usually 60 to 70 pounds. The standard U. S. bushel originally came from England, where it was called the Winchester bushel. The standard in England today is the *imperial* bushel. It is equal to 1.032 U. S. bushels.

10. In the United States, a bushel of wheat weighs 60 lb. If a boat is loaded with 50 short tons of wheat, how many U. S. bushels is this? How many imperial bushels? Round each answer to the nearest whole bushel.

Though we still quote prices as so much per bushel, most goods are first weighed in pounds.

11. As defined by law, 60 lb. of wheat make a bushel. A farmer's wheat crop weighs 30,000 lb. How many bushels is this?

12. In most states, the legal weight of a bushel of shelled corn is 56 lb. A farmer's corn crop (shelled) weighs 35,000 lb. How many bushels is this?

▶ There is confusion when the legal weights are different in different states.

13. The legal weight of a bushel of peaches is 40 lb. in Maryland and 50 lb. in North Carolina. A farmer's peach crop weighed 2000 lb. How many bushels was this in Maryland? In North Carolina?

14. Buckwheat weighs 40 lb. per bu. in California, and 56 lb. per bu. in Kentucky. How many bushels is 22,400 lb. in each state?

▶ Our standard mile, called the *statute* mile, is 5280 ft. The sea mile, or *nautical* mile, is about 6076.1 ft. A nautical mile is 1.15 statute miles. A speed of 1 nautical mile per hour is called a *knot.*

15. The speed of a fast ship is about 36 knots. This is equal to about (30; 36; 42) statute miles per hour.

▶ You have learned to read 2.4 as "two and four tenths." You read a decimal point as "and."

It is sometimes easy to get mixed up. "One hundredth" may sound like "one hundred." For this reason mathematicians and mechanics usually read 2.4 as "two point four." The decimal point is read as "point."

The mathematician reads 7.05 as "seven point oh-five." He reads a zero as "oh." He reads 16.1875 as "sixteen point one-eight-seven-five."

Read each of the following in two ways.

1.	3.54	.102	100.002	9.50
2.	2.7834	205.0057	169.0009	
3.	777.777	10.0712	370.053	
4.	61.013	0.3702	198.604	

▶ There are a number of good ways to make sure that the decimal point in a quotient is placed correctly. You have learned to use the following.

- Think what quotient is sensible and place the decimal point accordingly (page 83).
- Use the caret method (page 85).

Another method which can serve as a check is given below.

- Count the number of decimal places in the dividend and the divisor and place the decimal point accordingly (see below).

You have learned that there are as many decimal places in a product as in the multiplier and multiplicand together. Accordingly, when checking division by multiplication, there are as many decimal places in the dividend as in the divisor and the quotient together. We can turn the last statement around and say the following.

■ **The number of decimal places in the quotient is equal to the number in the dividend minus the number in the divisor.**

1. Place the decimal point in the proper place in the quotient.

$$3.24 \div 1.2 = 27$$

THINK: 2 Places in dividend
−1 Place in divisor
1 Places in quotient

Copy and place the decimal point in each quotient.

2. $1.952 \div 3.2 = 61$
3. $41.47 \div 29 = 143$
4. $5.032 \div .17 = 296$

5. Where should the decimal point be placed in this quotient?

$$7.8 \div .65 = 12$$

THINK: I cannot subtract 2 places from 1 place. The dividend must have at least as many decimal places as the divisor. I can add a zero to 7.8 to change it to 7.80. Then there will be ? places in the dividend, ? places in the divisor, and ? places in the quotient.

Use the new method of placing the decimal point.

6. $.73\overline{)11.753}$ $4.7\overline{)371.3}$

7. $.43\overline{)253.7}$ $7.9\overline{)1.0981}$

▶ It is often necessary to find how numbers are related to one another. Study the numbers below and try to find the relationship.

1 3 5 7 9 ? ? ?

8. What would the next three numbers be in the row above? Explain.

9. How are the following numbers related? Explain. What are the next three numbers?

1 4 9 16 25 ? ? ?

Write the next three numbers for each set below.

10. 2 4 6 8 ? ? ?

11. 2 4 8 16 ? ? ?

12. 1.5 2.25 3 3.75 ? ? ?

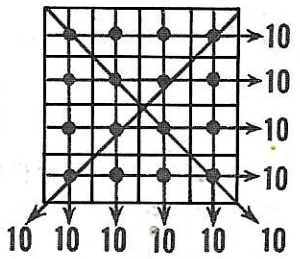
13. 7.5 6.25 5 3.75 ? ? ?

▶ Mathematical puzzles are interesting and they cause you to think carefully. Try to solve the following.

14. A toy dealer bought dolls for \$2.50 each, toy trucks for \$1.50 each, and balls for \$.25 each. He got 100 items for \$50. There were five times as many dolls as there were toy trucks. How many of each item did he get?

15. Rearrange the sixteen numbers at left below so that the numbers in each column, each row, and each diagonal will total 10.

1.3	1.3	1.3	1.3
1.6	1.6	1.6	1.6
2.4	2.4	2.4	2.4
4.7	4.7	4.7	4.7

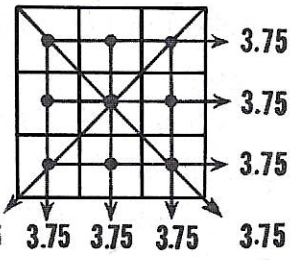


16. Arrange the following numbers so that the numbers in each column, each row, and each diagonal will total 3.75.

.25 .5 .75

1 1.25 1.5

1.75 2 2.25



Numbers can be fun. Numbers will do many interesting tricks if you know how to use them.

▶ Compare the two products in each line below. What relationship is there between them? How was the first multiplier changed to the second? How was the first multiplicand changed to the second?

1.	122×213	221×312
2.	112×124	211×421
3.	211×322	112×223
4.	112×133	211×331
5.	211×311	112×113

▶ The number 12,345,679 is often considered a "magic" number because of the way it behaves.

6. Joe asked Sue to choose a number from 1 to 9. She chose 5. He told her to multiply the magic number (12,345,679) by 45. Notice that 45 is 9 times the number she had chosen. Compare the number Sue had chosen with the product of 45 and the magic number.

Multiply the magic number by each of the following.

7.	9	18	27	36
8.	54	63	72	81

9. Compare each of the products in examples 7 and 8 with the quotient when the multiplier is divided by 9.

Multiply 12,345,679 by several of the following.

10.	12	15	21	24
11.	30	33	39	42

12. Can you notice any relationship among the multipliers given in examples 10 and 11? Can you find any other multipliers which will affect 12,345,679 in the same way?

13. If you have time, multiply 999,999,999 by the magic number. The product is interesting.

▶ Compare the products in each line below. What do you notice about the two multipliers in each row?

14.	1×1089	9×1089
15.	2×1089	8×1089
16.	3×1089	7×1089
17.	4×1089	6×1089
18.	5×1089	5×1089

▶ When a common fraction is changed to a decimal, the division often does not come out exactly

even. The fraction $\frac{1}{3}$, for example, will never come out exactly even.

$$\frac{1}{3} = 3\overline{)1.000000000000}\quad .333333333333\frac{1}{3}$$

Interesting things happen when certain fractions are changed to decimals. Notice what happens with the common fraction $\frac{1}{7}$.

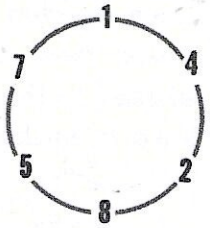
$$\frac{1}{7} = 7\overline{)1.0000000000000000}\quad .142857142857142857\frac{1}{7}$$

19. Change the fractions below to decimals. Carry out each division until something interesting appears.

$\frac{1}{13}$ $\frac{1}{17}$ $\frac{1}{19}$ $\frac{1}{23}$ $\frac{1}{29}$

▶ Besides repeating itself when $\frac{1}{7}$ is changed to a decimal, the number 142,857 is interesting in other ways.

$1 \times 142857 = 142857$
$2 \times 142857 = 285714$
$3 \times 142857 =$?
$4 \times 142857 =$?
$5 \times 142857 =$?
$6 \times 142857 =$?



20. By following around the circle, you find that the first and second products above have the same figures in the same order. The difference is that each product begins with a different figure.

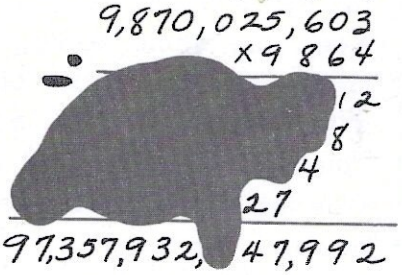
Do each of the other products follow the same pattern?

21. Rearrange the products in problem 20 so that they will fit into a chart like that below.

Complete the chart and compare the first row of numbers and the first column of numbers, the second row and the second column, etc.

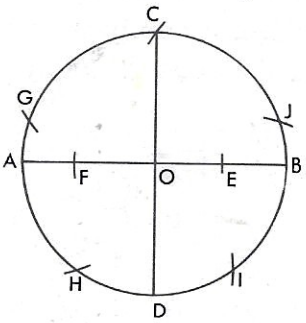
$1 \times 142857 =$	1	4	2	8	5	7
$3 \times 142857 =$	4	2	8	5	7	1
$2 \times 142857 =$	?	?	?	?	?	?
$6 \times 142857 =$	?	?	?	?	?	?
$4 \times 142857 =$	?	?	?	?	?	?
$5 \times 142857 =$	?	?	?	?	?	?

▶ Susan had worked for a long time on the multiplication below. Just as she completed her work, she accidentally spilled ink on her paper so that it was impossible to read one figure. She tried to figure out a way of finding the missing figure without multiplying again.



22. Use proof by nines to find the missing figure in the product.

On pages 138 and 139 you learned how to divide a circle into six and eight equal parts. You drew many interesting designs based on these circles. Dividing a circle into five equal parts is more difficult. Follow the steps below.

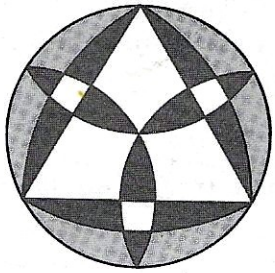


a. Draw a circle.
b. Draw perpendicular diameters *AB* and *CD*.
c. Bisect radius *OB* at *E*.
d. Using point *E* as center and *EC* as radius, draw an arc cutting *AO* at *F*.
e. Using *C* as center and *CF* as radius, draw an arc cutting the circle at *G*.
f. Keep the same radius and continue around the circle, drawing arcs at *H*, *I*, and *J*. Points *C*, *G*, *H*, *I*, and *J* divide the circle into five equal parts.

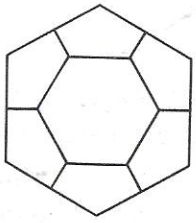
1. Draw a circle with radius $1\frac{1}{2}$ inches and divide it into five equal parts. Proceed around the circle, joining the five points with straight lines. What figure is formed within the circle?

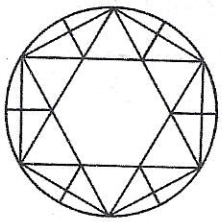
2. Draw a circle with radius $1\frac{1}{2}$ inches and divide it into five equal parts. Join the points to form a 5-pointed star.

3. Copy the design below. Into how many equal parts must the circle be divided? Explain how you drew each part of the design.



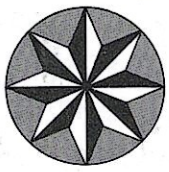
4. Copy the design at left below. The drawing at the right shows the lines needed to make the design. Since most of these lines will be erased in the completed design, be sure to make them very light.

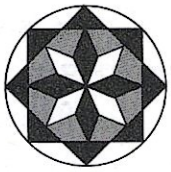




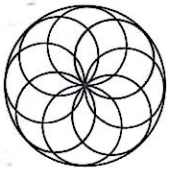
5. Copy the designs at the top of the next page. Into how many

equal parts must a circle be divided in order to draw these designs? Certain lines must be drawn and erased later in the completed designs.



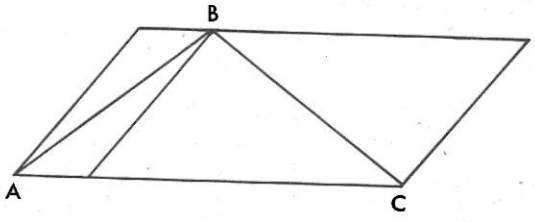


6. How many small circles are within the large circle in the design below? How can you find the center of each of the small circles? Copy the design.

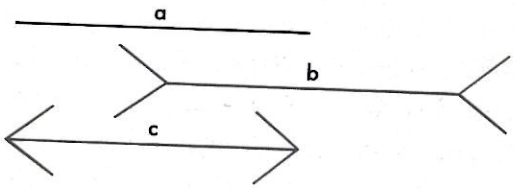


▶ An old saying is that "seeing is believing." But sometimes your eyes play tricks on you; you cannot always believe what you see. Answer each of the following questions on the basis of what you see. Then measure to check.

7. Which line below is longer, *AB* or *BC*?



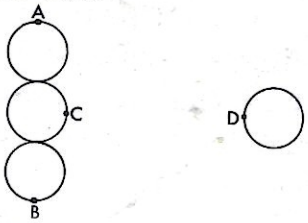
8. Find the shortest of the three straight lines below.



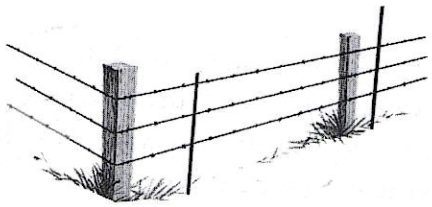
9. Which is longer, the horizontal line or the vertical line?

10. How many times will the wheel below go around in moving from *A* to *B*?

11. Find which distance is greater, *AB* or *CD*.

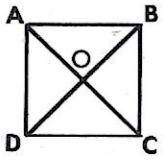


12. Which dark black line below is longer? How much longer?



If you think and plan carefully, you can use what you have learned about lines, angles, and shapes to explore much further. For example, you can find the area of a square if you know the length of a diagonal. Follow each step in example 1 carefully.

1. The diagonal *(AC)* of the square at right is 12 in. What is the area of the square?



THINK: If *AC* is 12 in., *BD* is also 12 in. Point *O* is at the midpoint of each diagonal, or 6 in. from each of the 4 corners of the square. Therefore, there are 4 triangles of the same size and shape *(AOB, BOC, COD,* and *DOA)*. Since the diagonals cross at right angles, each of the triangles is a right triangle with base 6 in. and height 6 in. The area of the square is 4 times the area of one of the triangles.

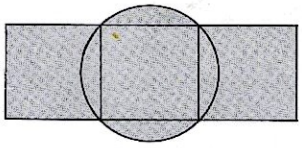
2. Try to find a way of finding the area of the square in problem 1 which uses only 2 triangles.

In solving each problem in the next column, use facts which you have learned as well as facts given in the problem.

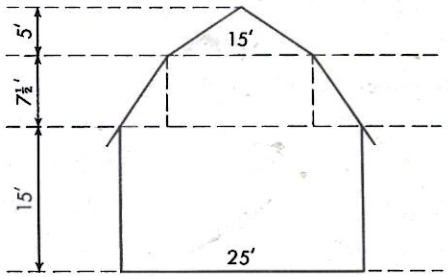
3. The circumference of a circle is 44 in. What is the area of the largest square that can be drawn within the circle? (Use $\pi = 3\frac{1}{7}$.)

THINK: Diameter of the circle will be the same as a diagonal of the square.

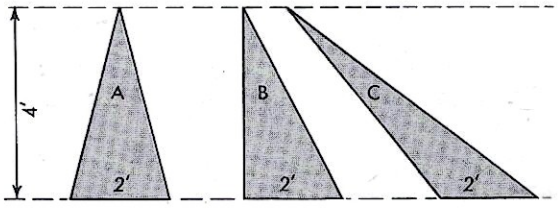
4. The figure below is made up of 3 squares of equal size and a circle whose circumference is 22 in. The area of the circle is $38\frac{1}{2}$ sq. in. What is the area of the entire figure?



5. The drawing below shows the end of a barn. Find the area.



6. Find the area of each of the triangles below.



On pages 114 and 115 you learned how to find interest on borrowed money. The page below is from an arithmetic book nearly a hundred years old. Study the method as it is explained and try to use this method to find the answers shown on the page.

SPECIAL METHOD FOR SIX PER CENT. IN U. S. MONEY.

172. At 6%, the interest for 1 year is 6 cents. Hence the interest is *six times as many cents as years.*

The interest for 1 month is $\frac{1}{12}$ of 6 cents, or $\frac{1}{2}$ cent. Hence the interest is *one-half as many cents as months.*

The interest for 6 days (which is $\frac{1}{5}$ of 30 days) is $\frac{1}{5}$ of the interest for 1 month, or $\frac{1}{5}$ of $\frac{1}{2}$ cent, or $\frac{1}{5}$ of 5 mills, which is 1 mill. Hence the interest is 1 mill for 6 days, or *one-sixth as many mills as days.* Hence the

Rule.—*Call six times the number of years, and half of the number of months,* cents, *and one-sixth of the number of days* mills, *and multiply the sum of these results by the principal. The product is the interest at six per cent.*

Ex. 1. What is the interest of $300 for 2yr. 8mo. 24da. at 6%?

WRITTEN PROCESS.

2 × 6cts. = 12cts: + ½ of 8cts. = $0.16
⅙ of 24m. = .004

300 × $0.164 = $49.20 Ans.

What is the interest	Answers.
2. Of $100 for 1yr. 2mo. 6da.?	$7.10.
3. Of $125 for 2yr. 4mo. 12da.?	$17.75.
4. Of $250 for 3yr. 6mo. 18da.?	$53.25.
5. Of $375 for 4yr. 8mo. 24da.?	$106.50.
6. Of $400 for 5yr. 10mo. 9da.?	$140.60.
7. Of $500 for 3mo. 3da.?	$7.75.
8. Of $600 for 5mo. 15da.?	$16.50.
9. Of $700 for 7mo. 21da.?	$26.95.
10. Of $800 for 9mo. 27da.?	$39.60.

It is often quite helpful to know whether a number can be divided exactly by another number. You know that any even number is divisible by 2, and that any number ending in 5 or in 0 may be divided exactly by 5. You also know that if the sum of the digits of a number is divisible by 3, the whole number may be divided exactly by 3. You have a similar rule for 9. The following work will help you find some tests to determine when a number can be divided exactly by 11.

1. Let 198 be the number to be tested. Subtract the figure in ones place from the rest of the number: $19-8=11$.

Our test tells us that when this remainder can be divided exactly by 11, then the whole number can be divided exactly by 11.

Divide 198 by 11 to see whether the test works.

2. Test to see whether 352 can be divided exactly by 11.

THINK: $35-2=33$. Since 33 can be divided exactly by 11, our test says that 352 can be divided exactly by 11.

Divide 352 by 11 to see whether the test works.

Test these numbers. Then divide each by 11 to check.

3. 792 583 451 484

4. 847 429 935 649

5. The process must be repeated to test whether a 4-figure number can be divided exactly by 11. The number to be tested is 3894.

THINK: $389-4=385$; $38-5=33$. Since 33 can be divided exactly by 11, our test says that 3894 can be divided exactly by 11.

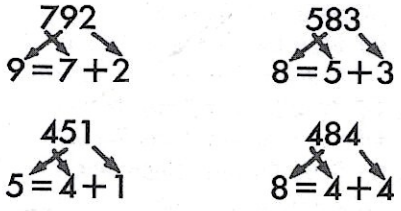
Divide 3894 by 11 to see whether the test works.

Test these numbers. Check by dividing.

6. 4741 7832 5632 6941

7. 1518 2838 8393 9284

8. Notice that in example 3 the figure in tens place is equal to the sum of the figure in hundreds place and the figure in ones place.



9. Notice that in example 4 the figure in tens place plus 11 is equal to the sum of the figure in

hundreds place and the figure in ones place.

847 → 4+11=8+7

429 → 2+11=4+9

935 → 3+11=9+5

649 → 4+11=6+9

10. Make up several examples to test whether these rules work for other 3-figure numbers.

11. How can you tell when to use each rule?

THINK: Compare the figure in tens place with the figure in hundreds place. Which is larger in example 3? In example 4?

12. Study example 6. Notice that in each number the sum of the figure in thousands place and the figure in tens place is equal to the sum of the figure in hundreds place and the figure in ones place.

4741 → 4+4=7+1

7832 → 7+3=8+2

5632 → 5+3=6+2

6941 → 6+4=9+1

13. State a rule based on each of these numbers from example 7.

1518 → 1+1+11=5+8

8393 → 3+3+11=8+9

14. Make up several examples to test whether these rules work with other 4-figure numbers.

▶ After studying the material above, Allen said, "I'll bet this works. Take any number. Find the sum of alternate figures. Find the sum of the rest of the figures. If the two sums are equal, or if the difference between the sums can be divided exactly by 11, the whole number can be divided exactly by 11."

15. Test Allen's rule with the number 819,273,634,091.

8+9+7+6+4+9 = 43

8 1 9 2 7 3 6 3 4 0 9 1

1+2+3+3+0+1 = 10

43 − 10 = 33

Divide 819,273,634,091 by 11 to test if Allen's rule works.

16. Use Allen's rule to test if 36,895,798,632 can be divided exactly by 11. Check by dividing the number by 11.

Test these numbers. Divide by 11 to check.

17. 496 3850 238,530,687

18. 998,911 4,329,842,005

19. Test the rule with other large numbers.

On page 54 you studied problems concerning distance and time. When you changed 45 miles per hour to feet per second (problem 4), you first multiplied 45×5280 ft. in order to change 45 miles to feet. Then you divided 237,600 ft. by 60 to find the number of feet per minute, and by 60 again to find the number of feet per second.

How many seconds are there in one hour? Explain why dividing 237,600 ft. by 3600 will give the same result as dividing twice by 60.

Study the example below.

$12 \times 2 \div 3$

$12 \times 2 = 24;\ 24 \div 3 = 8$

$\frac{\overset{4}{\cancel{12}}}{1} \times \frac{2}{\underset{1}{\cancel{3}}} = 8$

Multiplying by 2 and dividing by 3 is the same as multiplying by $\frac{2}{3}$. Then, multiplying by 5280 and dividing by 3600 is the same as multiplying by $\frac{5280}{3600}$ or $\frac{22}{15}$. Study the example below.

$$\frac{\overset{3}{\cancel{45}}}{1} \times \frac{22}{\underset{1}{\cancel{15}}} = 66$$

45 mi. per hr. = 66 ft. per sec.

Make up a short-cut rule for changing miles per hour to feet per second.

Change to feet per second.

1. 15 M.P.H. 60 M.P.H.
2. 50 M.P.H. 40 M.P.H.
3. $37\frac{1}{2}$ M.P.H. $22\frac{1}{2}$ M.P.H.
4. 30 M.P.H. $52\frac{1}{2}$ M.P.H.

When a driver sees danger ahead, an instant is needed to decide what to do. Another instant is needed to get his foot on the brake. The time between seeing the danger and getting the foot on the brake is called *reaction time*. The automobile moves on during reaction time just as if no danger had been sighted. The distance the automobile moves during reaction time is called the *reaction distance*.

Some drivers think and move more quickly than others. This makes the reaction time different for different persons.

5. An automobile is moving 30 miles per hour. The driver sees danger ahead. His reaction time is $\frac{3}{4}$ second. How many feet will the automobile move before he gets his foot on the brake? If a child

dashes out from between parked cars 30 ft. ahead, will the driver have had time to get his foot on the brake before he reaches the child?

Find reaction distances for the following.

	SPEED	REACTION TIME
6.	$22\frac{1}{2}$ M.P.H.	$\frac{3}{4}$ sec.
7.	45 M.P.H.	$\frac{1}{2}$ sec.
8.	60 M.P.H.	$\frac{5}{8}$ sec.
9.	$37\frac{1}{2}$ M.P.H.	$\frac{3}{8}$ sec.
10.	$52\frac{1}{2}$ M.P.H.	$\frac{1}{2}$ sec.

11. In the hall or on the playground, mark off the reaction distances for one or more of the problems above.

When the foot is put on the brake, the automobile does not stop at once. It merely begins to slow down. The distance it moves from the time the foot is on the brake till it stops completely is called the *braking distance.*

The braking distance depends upon many things, including how fast the car is moving, the condition of brakes and tires, the condition of the road, how heavily the car is loaded.

A traffic safety department gives the following figures as the average braking distance at various speeds.

M.P.H.	BRAKING DISTANCE	M.P.H.	BRAKING DISTANCE
15	18 ft.	40	120 ft.
20	30 ft.	45	152 ft.
25	47 ft.	50	188 ft.
30	67 ft.	55	227 ft.
35	92 ft.	60	270 ft.

The total distance a car moves from the instant danger is sighted till the car stops completely is the sum of the reaction distance and the braking distance. We call this total distance the *stopping distance.*

Find the stopping distance for the following.

	SPEED	REACTION TIME
12.	30 M.P.H.	$\frac{3}{4}$ sec.
13.	55 M.P.H.	$\frac{3}{8}$ sec.
14.	50 M.P.H.	$\frac{1}{2}$ sec.
15.	15 M.P.H.	$\frac{5}{8}$ sec.

16. A study shows that of drivers killed in auto accidents, 50% were exceeding speed limits, 20% were on the wrong side of the road, 15% were driving recklessly, and 15% of the accidents resulted from other carelessness. Make a circle graph to show these facts.

In Unit Ten you learned that when goods are sold on the installment plan, the buyer must pay an extra amount called the carrying charge. Because the money is repaid in small amounts, it is difficult to figure what per cent of interest the buyer actually pays. Most buyers would be surprised if they knew how much interest they are actually paying.

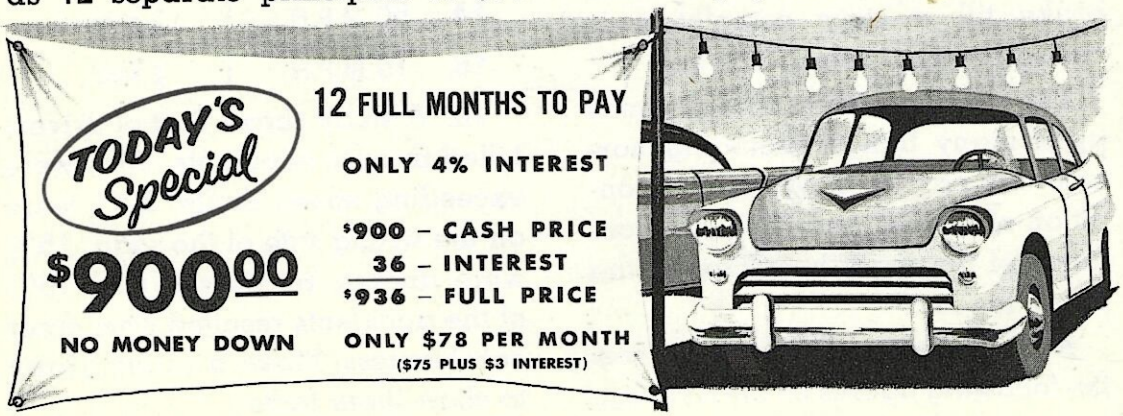
1. Study the advertisement below. On which amount is the interest figured? How long does the customer owe the full amount? Does he actually pay "only 4% interest"?

2. Mr. Lowe bought the car as advertised. What was the principal? How much of the principal did he repay each month?

If we think of the $900 principal as 12 separate principals of $75 each, we can find what annual rate of interest Mr. Lowe actually paid. Study the chart below.

	PRINCIPAL	LENGTH OF TIME KEPT BY MR. LOWE
(1)	$75	1 month
(2)	$75	2 months
(3)	$75	3 months
(4)	$75	4 months
(5)	$75	5 months
(6)	$75	6 months
(7)	$75	7 months
(8)	$75	8 months
(9)	$75	9 months
(10)	$75	10 months
(11)	$75	11 months
(12)	$75	12 months
12 × $75 (or $900)		78 months

3. How long did Mr. Lowe keep the first $75? What is the interest on $75 at 4% for 1 month? How much interest did Mr. Lowe actually have to pay on the first $75?



4. How long had Mr. Lowe kept the \$75 which he repaid at the end of the second month? What is the interest on \$75 at 4% for 2 months? How much interest did Mr. Lowe actually pay on the second \$75?

5. Explain why Mr. Lowe owed interest on \$75 for 78 months ($6\frac{1}{2}$ years) rather than on \$900 for 12 months (1 year).

6. What is the interest on \$75 at 4% for $6\frac{1}{2}$ years? How does this figure compare with the interest shown in the advertisement?

7. We multiply principal times rate times time to find interest. Explain the formula for finding rate when we know interest, principal, and time.

$$r = \frac{i}{p \times t}$$

8. Use the formula to find what annual rate of interest Mr. Lowe actually paid when he bought the automobile as advertised. (Round to the nearest tenth of a per cent.)

THINK: $r = \frac{\$36}{\$75 \times 6\frac{1}{2}}$

9. Loans are often repaid on the installment plan. Mr. Ray borrowed \$120. He repaid \$10 each month for 1 year. He also had to pay \$15.60 (\$1.30 each month) for the use of the money. What rate of interest did he pay?

10. After making a down payment, Mr. and Mrs. Allen owed \$300 on furniture which they had bought. They agreed to pay the money in monthly installments of \$25. How many months did it take them to pay off the amount due?

The Allens had to pay a carrying charge of \$26. What annual rate of interest did they pay?

11. Mr. Bates borrowed \$90. He agreed to repay it in monthly installments of \$15 each. How many months did it take to repay the loan?

Mr. Bates had to pay \$10.50 for the use of the money. What rate of interest did he pay?

THINK: He owed interest on \$15 for a total of ? months.

12. Mr. Slade borrowed \$1500 and agreed to repay it in monthly installments of \$62.50 each. How many months would this take?

He had to pay a total of \$125 for the use of the money. Find the rate of interest.

THINK: He owed interest on \$62.50 for a total of ? months.

On pages 248 and 249 you studied problems concerning consumer goods. These pages will help you explore further on this subject.

The price of consumer goods changes continually. Business and government agencies have collected information about price changes. It is difficult to compare prices for different years unless we think of them as higher or lower than the prices for a certain year with which we are familiar.

Let us say, for example, that a certain item costs $1.00 today. If that same item could have been bought for 90¢ five years ago, the price at that time was .9 as much as the price today. The two prices are in the ratio of 90 to 100.

Suppose that the same item could have been bought 25 years ago for 50¢. The price then was .5 or $\frac{1}{2}$ as much as it is today. We say that the two prices are in the ratio of 50 to 100.

If we compare the price of the item 25 years ago with the price 5 years ago, we are comparing 50¢ with 90¢.

Most tables containing comparative information about prices do not list actual prices in dollars and cents. Instead, they show the ratio of the price of goods at various times to the price of the same goods in a particular year. Such a table is called a *price index*.

The table at the bottom of this page compares the average prices of all consumer goods from 1755 to 1955. Although any year might

PRICE INDEX OF CONSUMER GOODS, ALL COMMODITIES, 1755-1955 (1935 = 100)

YEAR	INDEX	YEAR	INDEX	YEAR	INDEX	YEAR	INDEX	YEAR	INDEX	YEAR	INDEX
1755	25	1790	34	1825	40	1860	34	1895	27	1930	48
1760	30	1795	50	1830	36	1865	73	1900	31	1935	44
1765	27	1800	49	1835	41	1870	48	1905	33	1940	44
1770	29	1805	58	1840	39	1875	43	1910	39	1945	59
1775	29	1810	60	1845	35	1880	36	1915	39	1950	90
1780	86	1815	67	1850	35	1885	31	1920	86	1955	100
1785	35	1820	43	1855	38	1890	31	1925	57		

have been chosen, all prices in this table are compared to the price of goods in 1955. The table tells this with the note, "1955 = 100." We can think of this as meaning that goods which cost 100¢ in 1955 would have cost 25¢ in 1755, 40¢ in 1825, 27¢ in 1895, and so on.

1. In which year were prices highest? Lowest? How many times as high were prices in 1955 as in the lowest year?

2. A dress cost $16 in 1955. What would the same quality dress have cost in 1950?

THINK: $\frac{90}{100}$ or $.90 \times \$16 = ?$

3. What would food which cost $20 in 1955 have cost in 1950? In 1925? In 1900? In 1865? In 1780? In 1755?

4. Find out when the War for Independence, the War of 1812, the War Between the States, World War I, World War II, and the Korean War were fought. What do you notice about price levels in the years at the end or shortly after each of these wars?

5. In 1865 people complained that prices had never been as high as they were then. Were these complaints correct? Explain.

6. In 1955 a financial expert pointed out that prices were about 300% of what they had been 50 years earlier, about 277% of what they had been 75 years earlier, and about 263% of what they had been 100 years earlier. Explain.

7. Make a line graph which shows the price index as shown in the table.

▶ Government agencies also collect information concerning the levels of income of workers. The table below shows that for every 100¢ earned by a factory worker in 1955, he earned 81¢ in 1950, 64¢ in 1945, and so on.

INDEX OF PAYROLLS FOR FACTORY WORKERS 1925-1955 (1955 = 100)

YEAR	INDEX	YEAR	INDEX
1925	23	1945	64
1930	20	1950	81
1935	17	1955	100
1940	25		

8. Copy that part of the graph (number 7) which shows the figures for the years 1925-1955. On this same graph draw a red line to represent the figures given in the table above. Did wages rise and fall at about the same rate as prices? Explain.

Major league baseball has become a big business. The problems on this page deal with profits from World Series games.

1. In the 1950 World Series, the four games were attended by about $\frac{1}{5}$ million people. The total admissions amounted to about $1 million. What was the average cost per admission?

2. In 1954, there were also only four games in the series. About $\frac{1}{4}$ million persons paid about $1\frac{1}{2}$ million in admissions. What was the average cost per admission in 1954?

3. In 1955 there was a 7-game series. About $\frac{1}{3}$ million persons attended the games. Admissions totaled about $2\frac{1}{3}$ million. What was the average cost per admission in 1955?

A large share of the gate receipts from World Series games is divided among the players. The graphs at the bottom of this page show how the players' pool is distributed. No matter how many games are played in a series, the players' pool is 85% of the gate receipts of the first four games only.

4. Total gate receipts for the first four games in the 1955 series amounted to $1,237,515.34. What was the players' pool?

5. In addition to the share of gate receipts (problem 4), the 1955 players' pool included $83,000 from television receipts. What was the total amount in the players' pool?

6. How much of the players' pool (problem 5) went to the two contesting teams? To the other six first-division teams?

HOW WORLD SERIES PLAYERS' POOL IS SPLIT UP
(85% of gate receipts of first four games)

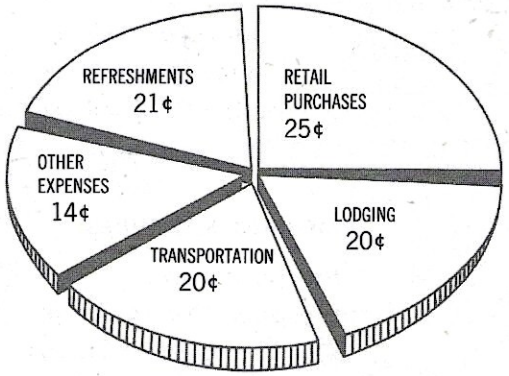
PLAYERS ON TWO CONTESTING TEAMS 70%		PLAYERS ON SIX OTHER FIRST DIVISION TEAMS 30%		
PLAYERS ON WINNING TEAM 60%	PLAYERS ON LOSING TEAM 40%	Second Place Teams 50%	Third Place Teams $33\frac{1}{3}$%	Fourth Place Teams $16\frac{2}{3}$%

7. How much money was distributed among the players of the team which won the series? Among the players of the losing team?

8. How much money was distributed among the players of the two second-place teams? This money was split evenly between the two teams. How much did each team receive?

9. Find the amount distributed among the players of each third- and fourth-place team in each league.

▶ Providing for tourists is a big business in many parts of our country. A magazine article included the graph below to show how the average tourist's dollar is spent.



10. An average of 40,000 tourist cars are in a certain state each day during the tourist season. Their average expenditures are $1.3 million per day. What is the average amount spent per tourist-car group per day? What amount is spent per car for transportation? For lodging? For restaurants? For retail purchases? For other expenses?

11. The Bensons plan to take an 8-day tour. At an average of $32.50 per day, how much will they spend in all? How much will they spend for lodging? For transportation? For restaurants? For retail purchases? For other expenses?

▶ The motion picture industry in the United States is a big business. Study the problems below.

12. There are about 20,000 motion picture theaters in the United States, with about 12 million seats. What is the average number of seats per theater?

13. The average cost of admission is 50¢. Each seat (problem 12) is used by an average of $1\frac{1}{2}$ persons per day. What does the average theater collect from the sale of tickets per day?

14. There are about 170 million people in the United States. How many persons is this for each of the nation's 20,000 theaters?

TABLES OF MEASURES

MEASURES OF COUNTING

1 unit
1 dozen (doz.) = 12 units
1 score = 20 units
1 gross = 144 units, 12 doz.

MEASURES OF WEIGHT

1 ounce (oz.)
1 pound (lb.) = 16 oz.
1 hundredweight (cwt.) = 100 lb.
1 ton (T.) = 2000 lb.
1 long ton = 2240 lb.

MEASURES OF LENGTH

1 inch (in.)
1 foot (ft.) = 12 in.
1 yard (yd.) = 3 ft.
1 rod (rd.) = $5\frac{1}{2}$ yd., $16\frac{1}{2}$ ft.
1 mile (mi.) = 320 rd., 1760 yd., 5280 ft.

LIQUID MEASURES

1 fluid ounce (fl. oz.)
1 pint (pt.) = 16 fl. oz.
1 quart (qt.) = 2 pt.
1 gallon (gal.) = 4 qt.

DRY MEASURE

1 pint (pt.)
1 quart (qt.) = 2 pt.
1 peck (pk.) = 8 qt.
1 bushel (bu.) = 4 pk.

MEASURES OF AREA

1 square inch (sq. in.)
1 square foot (sq. ft.) = 144 sq. in.
1 square yard (sq. yd.) = 9 sq. ft.
1 square rod (sq. rd.) = $30\frac{1}{4}$ sq. yd.
1 acre (A.) = 160 sq. rd.
1 square mile (sq. mi.) = 640 A., 1 section

COOKING MEASURES

1 teaspoon (tsp.)
1 tablespoon (tbs.) = 3 tsp.
1 cup (c.) = 16 tbs.
1 pint (pt.) = 2 c.
1 quart (qt.) = 2 pt.

MEASURES OF TIME

1 second (sec.)
1 minute (min.) = 60 sec.
1 hour (hr.) = 60 min.
1 day (da.) = 24 hr.
1 week (wk.) = 7 da.
1 year (yr.) = 365 da. / 52 wk. / 12 mo.
1 leap year = 366 da.
1 decade = 10 yr.
1 century = 10 decades / 100 yr.

MEASURES OF VOLUME

1 cubic inch (cu. in.)
1 cubic foot (cu. ft.) = 1728 cu. in.
1 cubic yard (cu. yd.) = 27 cu. ft.

FORMULAS

Square: $p = 4s$, $A = s^2$

Rectangle: $p = 2l + 2w$, $A = l \times w$

Triangle: $p = a + b + c$, $A = \frac{b \times h}{2}$

Circle: $c = \pi d = 2\pi r$

Rectangular solid: $V = l \times w \times h = lwh$

ANGLES AND ARCS

Right angle = 90°
Straight angle = 180°
Circle = 360°

MISCELLANEOUS MEASURES

1 gallon (gal.) = 231 cubic inches (cu. in.)
1 bushel (bu.) = 2150.42 cubic inches (cu. in.)
1 cubic foot (cu. ft.) = $7\frac{1}{2}$ gallons (gal.) .8 bushel (bu.)
1 cubic foot of water = $62\frac{1}{2}$ pounds (lb.)
1 gallon of water = $8\frac{1}{3}$ pounds (lb.)
1 cubic foot of ice = $57\frac{1}{2}$ pounds (lb.)
1 nautical mile = 6076.1 feet (ft.) 1.15 miles (mi.)
1 knot = 1 nautical mile per hour

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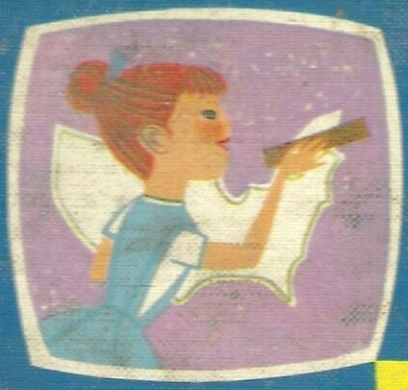

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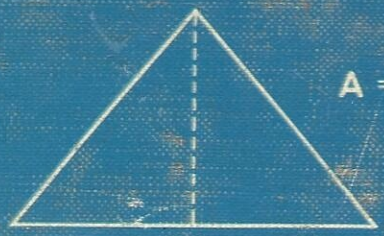

COMMUNITY BANK

PAY TO _____ $_____

_____ DOLLARS

DEPOSIT SLIP

ACCOUNT _____ DATE _____

7

EXPLORING Arithmetic